AGRICULTURAL CHEMICALS

A MONTHLY MAGAZINE FOR MANUFACTURERS, PROCESSORS AND DISTRIBUTORS

Serving the field of...

AGRICULTURAL INSECTICIDES

•

FUNGICIDES

•

STOCK DIPS AND SPRAYS

•

DAIRY FARM CHEMICALS

•

FUMIGANTS

•

WEED CONTROL CHEMICALS

•

SOIL TREATING MATERIALS

•

SEED TREATING CHEMICALS

•

RODENTICIDES

•

FERTILIZERS

Nov. 1946

Vol. 1 No. 7

FOUR PESTS THAT CAUSE GREAT DAMAGE TO HEALTH AND CROPS

COMMON HOUSE FLY

CODLING MOTH

COLORADO POTATO BEETLE

Control by DDT

promises huge annual savings

DDT (Dichloro-diphenyl-trichloroethane) has shown phenomenal results in killing the mosquito and common housefly. The U. S. Department of Agriculture has provided suitable formulations of DDT for the control of these pests —which Baker will gladly supply upon request.

Experiments with DDT for the control of the codling moth and the Colorado potato beetle, costly horticultural pests, already show great promise. However, tests in the agricultural field, to be conclusive generally require several growing seasons. As a result, only tentative formulation recommendations have been made pending further research.

Baker's DDT is a granular product approaching a white color, with a minimum setting point of 89°. It is available in 25, 50, 100 and 200 pound containers. Write for prices, stating your requirements.

FREE DDT BIBLIOGRAPHY—The J. T. Baker Chemical Co. has collated, in brief form, releases regarding DDT from various governmental branches. If you would like a free copy, write to: J. T. Baker Chemical Co., *Executive Offices:* Phillipsburg, N. J.

Baker's

Baker's Chemicals

Baker's

C. P. ANALYZED • FINE • INDUSTRIAL

MONSANTO

hexaethyl tetraphosphate

for control of aphids, "red spider" and citrus mites

First introduced in the U. S. by Monsanto, hexaethyl tetraphosphate (known in Germany as "Bladan") is now available in commercial quantities.

This chemical compound has been found definitely valuable in controlling aphids, "red spider" and citrus mites, in dilutions of from 0.25% to less than 0.025%. It also shows promise as a control for other damaging insects.

Solutions of Hexaethyl Tetraphosphate . . . Preliminary tests indicate that Hexaethyl Tetraphosphate is most effective in an emulsion form. Typical emulsions for spraying may be prepared by dissolving Hexaethyl Tetraphosphate in a suitable solvent, such as xylene, and incorporating an emulsifying agent. This solution may then be added to water in the proper concentrations to form the emulsion.

For further information, write: MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second Street, Saint Louis 4, Missouri.

EMPIRICAL FORMULA:
$C_{12}H_{30}O_{13}P_4$

TABLE OF PROPERTIES	
APPEARANCE:	Light straw to amber colored, mobile liquid.
SPECIFIC GRAVITY:	Approximately 1.3 or 10.7 lbs./gal.
CRYSTALLIZING POINT:	Solidifies at approximately minus 40° C.
BOILING POINT:	Decomposes at 150° C. and above.
SOLUBILITIES:	Miscible with water, acetone, alcohol, benzene, carbon tetrachloride, chloroform, diacetone alcohol, ethyl acetate, glycerine, orthodichlorobenzene, pine oil, toluene, xylene, alkyl naphthalenes, etc. Not miscible with kerosene or petroleum ether.
STABILITY:	Tests presently under way indicate that Hexaethyl Tetraphosphate as such is stable, but when diluted in water slowly hydrolyzes. Pending completion of these tests it is recommended that spray solutions be used within four hours after dilution.
TOXICITY TO ANIMALS:	Preliminary tests on rats indicate that Hexaethyl Tetraphosphate is toxic to warm-blooded animals. Until further information is developed all due precaution must be observed in the application and handling of this chemical and its formulations to avoid skin contact or accidental ingestion.

MONSANTO CHEMICALS
SERVING INDUSTRY WHICH SERVES MANKIND

THE *Perfect* TEAM

YOUR BUSINESS AND THE MGK FRANCHISE PLAN

•Just as the pointer backs up the setter, so can we back up your local organization with our Manufacturer's Franchise Plan.

The combination of *your* local organization with *our* nationally known Pyrocide* and Multicide* trade names, makes a *perfect profit-producing team.*

Investigate the MGK Pyrocide-Multicide Plan for making dusts and sprays. It is a complete plan... includes research, testing, manufacturing, advertising, labeling and selling.

*Trade Marks Registered U. S. Patent Off.

Better Insecticides

McLAUGHLIN GORMLEY KING COMPANY

Makers of Insecticides **Founded 1902**

Minneapolis, Minnesota

McLaughlin Gormley King Co.
Minneapolis, Minnesota

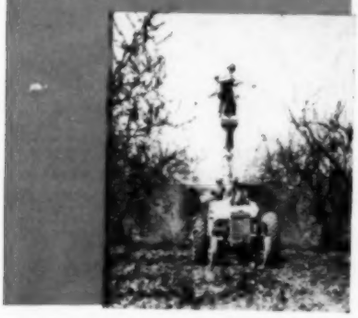
Please send, without obligations, full details of your Franchise Plan.

Name.....

Address.....

City.....State.....

AGRICULTURAL CHEMICALS



THIS MONTH'S COVER

Large high pressure orchard sprayer designed to permit spraying while moving forward. Tower is fixed in height, but can be folded over top of tank when in transit. (Photo courtesy Dr. O. C. French, University of California. Complete article on Pest Control Equipment by Dr. French will appear soon.)

NOVEMBER, 1946
Vol. 1 No. 7

In This Issue:

Editorials 13
Guest Editorial 14
By Hon. W. H. Allen
Dithiocarbamate Fungicides 15
By Dr. S. E. A. McCallan
Hexaethyl Tetraphosphate 19
By T. E. Bronson and S. A. Hall
Chemical Seed Treatment 22
By G. F. Miles
Cattle Dipping 26
By Milton A. Lesser
Insecticide Dealer 31
By Hugh Benjamin
Fertilizer as a Consumer of Chemicals 33
By Maurice H. Lockwood
DDT and Dairy Farm Sanitation 37
By Drs. E. M. Searls and Alfred Weed
Experiment Station Digest 39
By H. H. Slawson
Comments 41
By Dr. Alvin J. Cox
The Listening Post 43
By Paul Miller and G. J. Haeussler
Technical Briefs 47
Industry News 51
Suppliers' Bulletins 59
Market Report 61
Patents and Trade Marks 63
Classified Advertising 65
Advertisers' Index 65
Tale Ends 66

AGRICULTURAL CHEMICALS

254 West 31st St., New York 1, N. Y.

Subscription Rates: *One year* $3.00, *two years* $5.00. *Outside U. S. one year,* $4.00.

Published monthly on the 15th by Industry Publications, Inc. Advertising and editorial office, 254 W. 31st St., New York 1, N. Y. Advertising rates made known on application. Closing date for copy—25th of the month previous to date of issue.

Entered as Second Class Matter at the Post Office at New York, N. Y., August 29th, 1946, under the Act of March 3rd, 1879.

IRA P. MACNAIR
Editor

WAYNE E. DORLAND
Associate Editor

LAWRENCE A. LONG
Managing Editor

THOMAS MORGAN
Advertising Manager

Editorial Advisory Board . . .

DR. ALVIN J. COX
Palo Alto, Calif.

LEA S. HITCHNER
New York

DR. S. E. A. MCCALLAN
Yonkers, N. Y.

DR. CHARLES PALM
Ithaca, N. Y.

S. A. ROHWER
Washington, D. C.

"Never mind the bankroll. Hand over those ORBISCIDE INSECTICIDE CONCENTRATES!"

Here's a plug ugly who really knows a steal when he sees one. He knows that ORBISICIDE INSECTICIDE CONCENTRATES are worth more than this cattleman's bankroll.

That's why – when the posse caught up with him – he confessed, "I did it because Orbis makes the best insecticide concentrates for Manufacturers of Finished Products I ever saw. They are easy to use because they are designed that way. You just follow the simple directions and the job is done. Besides, they are the clearest concentrates I ever swiped, so help me."

Rotenone Oil Concentrates Made with Orbis Resins

5% Rotenone Oil Concentrate
1½% Rotenone Emulsifiable Concentrate

DDT Oil Concentrates

25% DDT Emulsifiable Concentrate
30% DDT Oil Concentrate
DDT plus Rotenone Emulsifiable Concentrate

Powder Concentrates

4-5% Rotenone Cubé Powder
50% DDT Wettable Powder
50% DDT Micronized Powder

Write today for information and prices. Our technical department will help solve your insecticide problems at no cost to you.

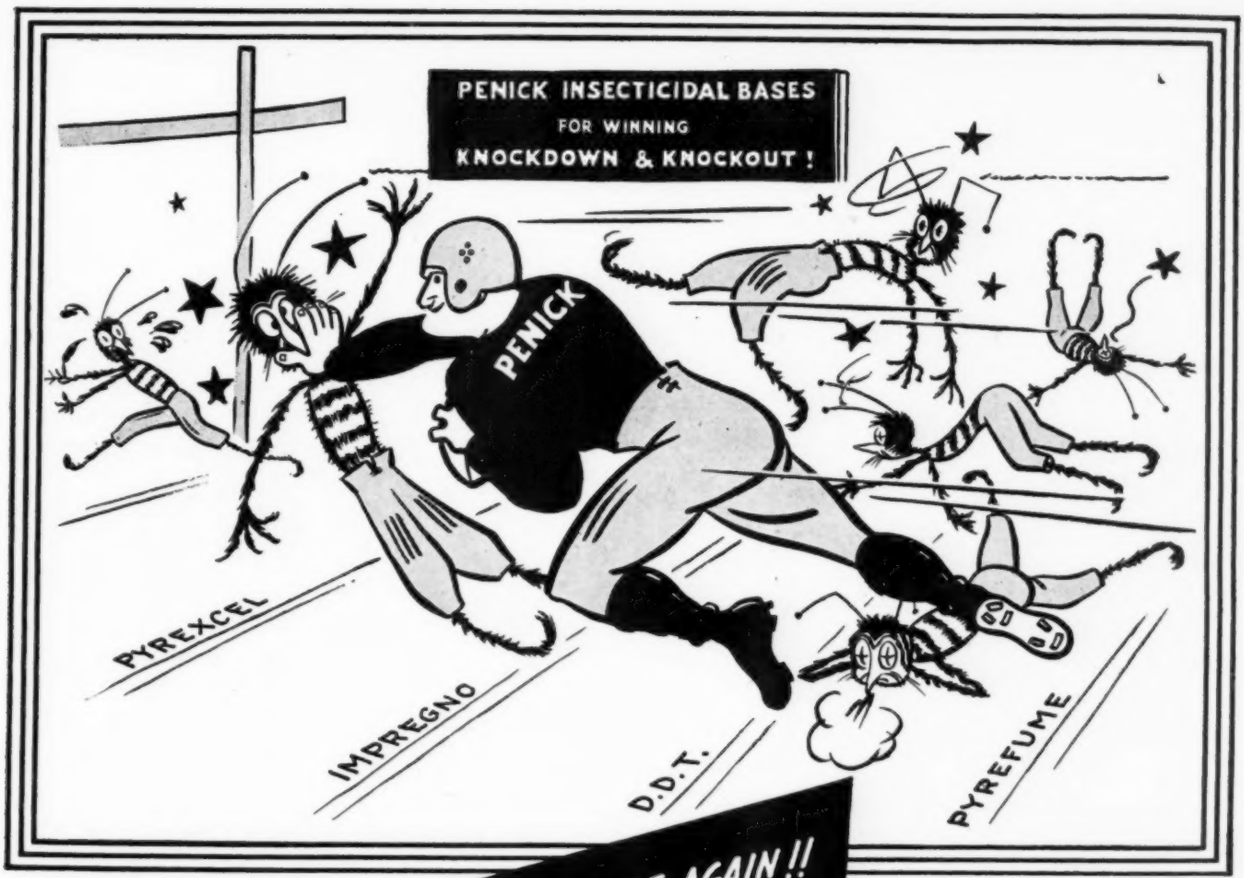
INSECTICIDE SALES DIVISION

COSMETIC RAW MATERIAL	PERFUME BASES	QUINCE SEED
WATER SOLUBLE GUMS	ESSENTIAL OILS	OLEO RESINS
FOOD COLORS	FRUIT FLAVORS	STEARIC ACID

ORBIS PRODUCTS CORPORATION
215 PEARL STREET, NEW YORK
FACTORY AND LABORATORY: NEWARK, N. J.

WAXES
THYMOL
AROMATICS

CHICAGO PHILADELPHIA MEXICO, D.F BOSTON LOS ANGELES MEMPHIS, TENN.



PENICK INSECTICIDAL BASES SCORE AGAIN!!

HERE's a team of Death Dealers that can't be beaten . . . Ruthless, potent killers that you can always put your money on and know they will win against all comers in the Pest and Vermin League.

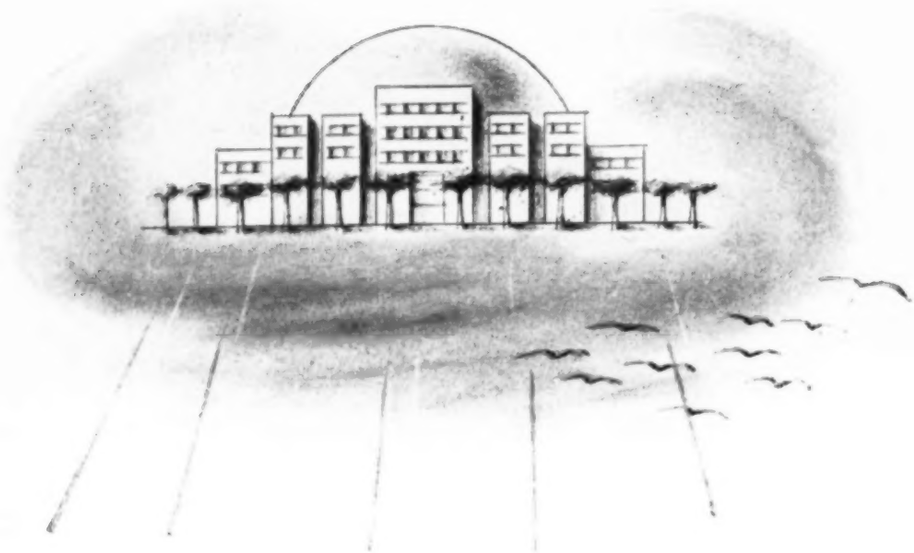
Read all about the following favorite champions . . . in literature that we will gladly furnish on request.

PYREXCEL 20	For household and livestock sprays
PYREFUME SUPER 20	For the house fly and mosquito
PYRETHRUM, IMPREGNO, AND DDT	For roaches and other household pests
DDT, PYRETHRUM, AND ROTENONE	For large acre farms
DDT, AND PYREFUME SUPER 20	For livestock sprays
FOLIAFUME	For plant sprays
PYRETHRUM EXTRACT	For gardens, greenhouses and nurseries
FORTIFIED RED SQUILL	For rats and mice

S. B. PENICK & COMPANY

50 CHURCH STREET, NEW YORK 7, N. Y.
Telephone, COrtlandt 7-1970

735 WEST DIVISION STREET, CHICAGO 10, ILL.
Telephone, MOHawk 5651



Dream Hospital...

The hospital depicted here exists only in the hearts of men and women who are losing the grim battle with cancer. And in the imagination of other men and women who want desperately to provide a haven for these victims in need of hope and care to sustain them in the few months or years still remaining to them.

Actually, there is not a single such hospital anywhere devoted exclusively to these unfortunates who *may* be beyond the help of medical sciences, but who are still certainly in urgent need of hospital care. And only a limited, woefully insufficient number of beds available to them in other hospitals.

During the long years of the war we gave up our plans for the building of this dream hospital... **Hope Institute.**

But now we are more than ever determined to see it rise in stone and steel. A model hospital, the first of its kind ... cheerful and comfortable in every way ... with more the atmosphere of an apartment hotel than of a cold institution. Where the patients, depending upon their condition, can enjoy the warm hospitality of lounge and dining room, or retire to the merciful seclusion of a private room.

What do we need to build this hospital now? **You.** Every dollar or penny you can scrape together for it. Whether or not you know this tragedy from bitter personal experience ... the tragedy of whole families, endlessly frustrated in their determination to care for a doomed member ... give as generously as you can. Please fill out the coupon below and mail with your contribution. It will make this hospital more than a dream.

NCF

THE NATIONAL CANCER FOUNDATION
GRIFFIN BUILDING
85 FRANKLIN STREET • NEW YORK 13, N. Y.

NAME _____

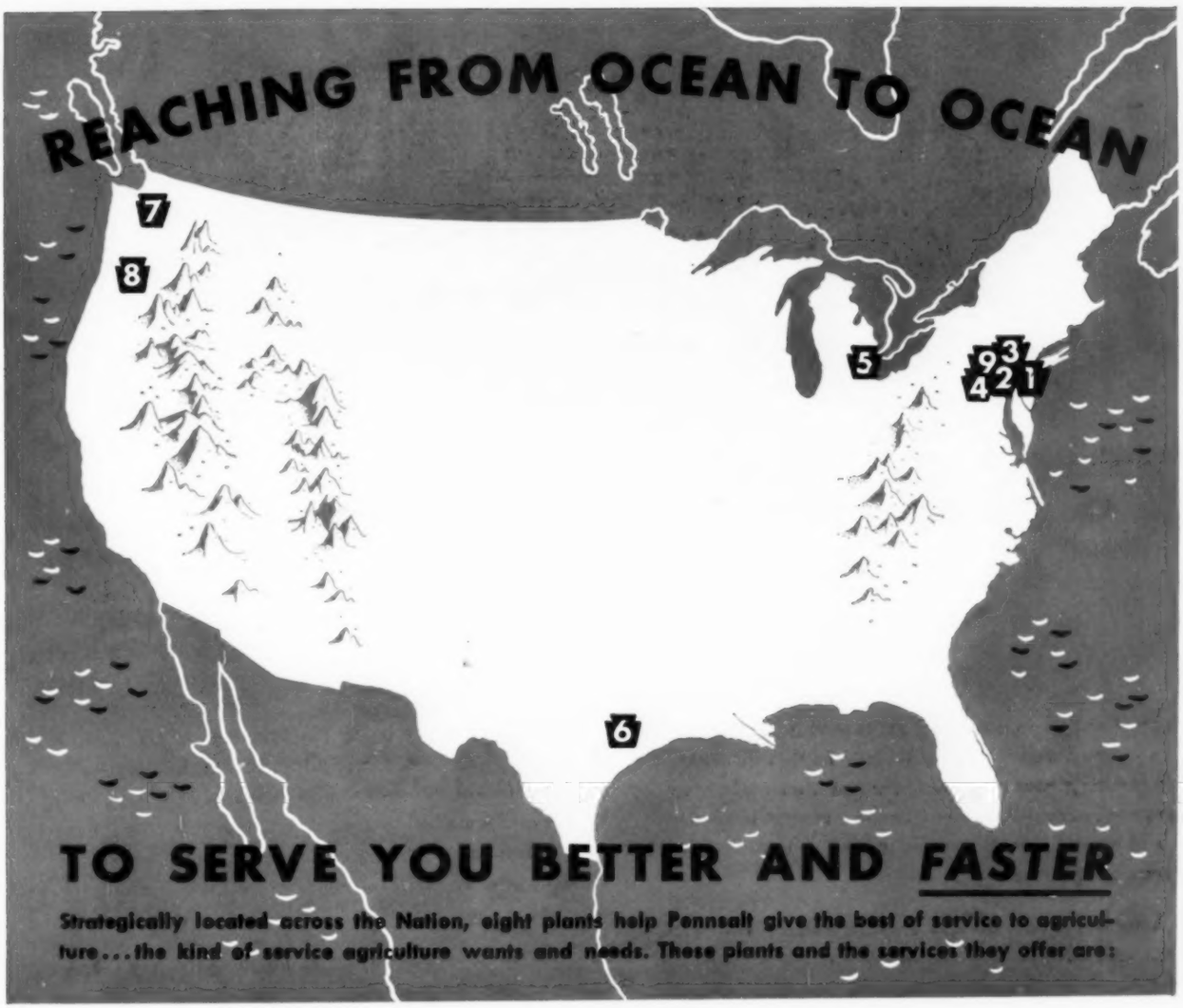
ADDRESS _____

Make checks payable to Abbott Kimball, Treasurer of the National Cancer Foundation.

THE NATIONAL CANCER FOUNDATION

AFFILIATED WITH

SPONSORS OF GOVERNMENT ACTION AGAINST CANCER
THE NATIONAL FOUNDATION FOR THE CARE OF ADVANCED CANCER PATIENTS


REACHING FROM OCEAN TO OCEAN
7
8
5
9
3
4
2
1
6
TO SERVE YOU BETTER AND FASTER
Strategically located across the Nation, eight plants help Pennsalt give the best of service to agriculture... the kind of service agriculture wants and needs. These plants and the services they offer are:

1 PITTSTOWN, N. J.: Pennsalt's original DDT manufacturing plant, engaged in the production of DDT Technical.

2 CORNWELLS HEIGHTS, PA.: Penco DDT insecticides, Penite chemical weed killers, Kryocide natural cryolite insecticide. Penco Grain Fumigant are warehoused here.

3 EASTON, PA.: Home of Penco Solvent Concentrate and Penco Emulsion Concentrate . . . both DDT products.

4 NATRONA, PA.: Most important of the Pennsalt plants connected with agricultural chemicals. Produces Kryocide, DDT Technical, Penco DB-50, Penco WB-50 and Penco Cattle Spray . . . the last three all being DDT insecticides.

5 WYANDOTTE, MICH.: At this, Pennsalt's largest plant, Penco Grain Fumigant is produced and warehoused.

6 BRYAN, TEXAS: Produces and distributes Penco Calcium Arsenate and mixtures, also DDT bases and mixtures.

7 TACOMA, WASH.: Penite chemical weed killers are made here. In addition, this plant serves as sales office for 11 Western States.

8 PORTLAND, ORE.: Manufactures Sodium Chlorate weed killer.

9 WHITEMARSH RESEARCH LABORATORIES—Pennsalt's spacious new research center, where exploration for new and better agricultural chemicals is a continuing project.

Pennsalt's line of agricultural chemicals includes a product for most agricultural needs. For full information about these products, write our Agricultural Chemicals Division.

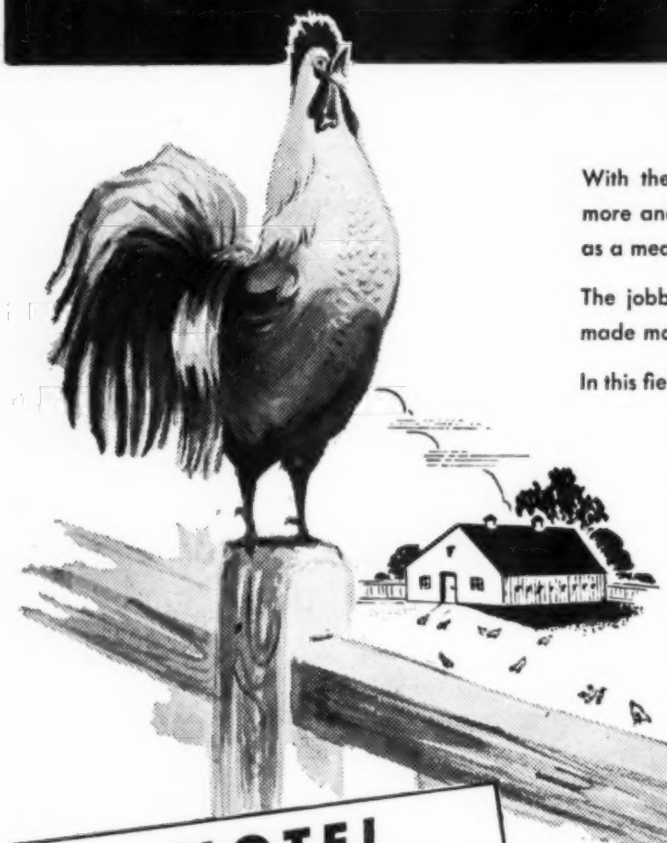
PENCO
AGRICULTURAL CHEMICALS

Agricultural Chemicals Division
PENNSYLVANIA SALT
MANUFACTURING COMPANY
Chemicals
1000 WIDENER BUILDING, PHILADELPHIA 7, PA.
BRYAN, TEXAS TACOMA, WASH.

Mr. Jobber—

Are you getting your share of this

PROFITABLE MARKET?



With the unprecedented demand for poultry products today, more and more poultry raisers are adopting sanitary measures as a means of increasing production.

The jobber or distributor who goes after this lucritive, ready-made market will find it most profitable.

In this field, products by Baird & McGuire have long been recognized for their outstanding performance. Scientifically formulated, tried and proven under the most difficult conditions, each Baird & McGuire product is backed by a third of a century of chemical research and production skill.

DISINFECTANTS

MITE KILLERS

CLEANERS

INSECTICIDES

NOTE!

These products can be packed under your own PRIVATE LABEL. Write TODAY for prices and full details.

Baird & McGuire, Inc.

St. Louis, Mo. Holbrook, Mass.

Baird's

TANK CARS • DRUMS • CARLOADS **DISTRIBUTORS AND JOBBERS ONLY**

4 more reasons ...for using ATTACLAY*

Most carriers and diluents are little more than "extenders". As dust ingredients, they serve to dilute poison strength, but fall short of helping to ease manufacturing steps. You'll find Attaclay different! It not only has characteristics that improve products, but to many producers of both dust concentrates and final blends, Attaclay is bringing much more. It's helping to make processing and handling steps easier . . . *and where values multiply, so do profits.*

How does Attaclay do this? Let's move, step by step, through a typical plant.

- **Mixing or Grinding Machine — Here, Attaclay's amazing adsorptive power greatly increases the efficiency and capacity of blending equipment. The flowability of the mixed or ground product is fully retained. Even 50% DDT dust concentrates turn out lump-free, with grinding "headaches" minimized. Attaclay will accept 30%, by weight, of liquid organic poisons (often oily or viscous), yet remain dry and free-flowing.**
- **Conveyors — Attaclay helps insure full, trouble-free operation of conveyor systems.**
- **Packaging Machines — With Attaclay, the packaging step will be more "continuous" . . . fewer clogs and shut-downs.**
- **Shipping — Attaclay's persistent fluffiness means little settling in packages during transportation.**

It's sound logic to use a carrier or diluent that does more than fill a formula. We'll help you prove that point with Attaclay.

* *The first of two "shop" talks about Attaclay's features. This one concerns dust manufacturers.*

ATTAPULGUS CLAY COMPANY

Dept. P, 260 South Broad St., Philadelphia 1, Pa.

YES POWELL HAS 2,4-D!

IN FOUR POWCO FORMULATIONS

1 **Sodium Salt of 2,4-D**
(83.8% 2, 4-Dichloro-phenoxyacetic Acid)

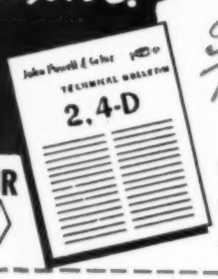
2 **Morpholine Salt of 2,4-D**
(Liquid Concentrate—Goes into solution in water)

3 **Methyl Ester of 2,4-D**
(Forms creamy, stable emulsion in water. Effective against wood shrubs and water hyacinth)

4 **N-Amyl Ester of 2,4-D**
(Forms creamy, stable emulsion in water. Effective against wood shrubs and water hyacinth)

Here are four Powco formulations of this revolutionary weed killer ready to go to work for you. Powell conducted a year's research before offering these products to manufacturers. It will pay you to investigate the possibilities of these Powco Brand 2, 4-D Concentrates.

JOHN POWELL & CO., INC.
BASIC MATERIALS FOR
INSECTICIDE MANUFACTURERS
ONE PARK AVE, NEW YORK 16, N.Y.



GET YOUR COPY ⇨

Send Today! **John Powell & Co., Inc.**
One Park Ave., New York 16, N. Y.

☐ Please send samples of your 2,4-D formulations.
☐ Please send technical bulletin on your 2,4-D products.

Name ..... Position .....
Company .....
Address .....

THE EDITOR COMMENTS

FURTHER pressure for a uniform state law to regulate economic poisons is brought to bear by the recent action of the National Council of Farmer Cooperatives of Washington, D. C. This group, representing some 4,800 local co-op units with 2,400,000 farmer members, is calling upon its full membership to support the movement, already under way, to draft a workable and comprehensive uniform insecticide law to stand as a model for state legislation.

Following the failure of a new federal insecticide act to pass the last session of Congress, prompt cooperation between Department of Agriculture, state and trade association officials, laid the groundwork for the new model state insecticide law. That this model is also being drawn with a view to its possible acceptance as a new federal act to replace the outmoded Insecticide Act of 1910 is quite generally known. The aim of the cooperating groups, comprising outstanding authorities on insecticide laws and their enforcement, is the eventual replacement of the present heterogeneous collection of conflicting state laws with a single uniform law for the federal government and all states.

This action of the Farmer Cooperatives, if it does nothing else, will demonstrate to almost two-and-a-half million farmers the manner in which industry and government can cooperate to give them a sensible, workable law to protect their interests.

THAT the proverbial "stitch in time" is applicable to the insect control field is seen in a pair of recent instances where early steps toward prevention could have halted major infestations.

In New York State a sudden outbreak of pear psylla late in the season damaged quantities of fruit and many trees, taking most orchardists completely by surprise. State entomologists report that pear psylla have been scarce since 1940, almost to the point of non-existence. Fruit growers had thus come to disregard the threat, relaxing their usual watchfulness. Normal spring and summer spraying would have stopped the invasion before it began.

A similar situation arose in the peanut belt this year when a bumper yield from more than a million acres of this important crop was seriously threatened by velvet bean caterpillar. Surprised and awed by the suddenness and scope of the infestation, growers voiced a frantic appeal for help. The answer came in a spectacular manner when an eastern manufacturer shipped fifty tons of cryolite by chartered plane, followed by six trailer trucks and 35 freight cars loaded with the insecticide. The larger part of the crop was saved, but at a cost far greater than normal circumstances would require.

Industrial and governmental research over the years has provided effective controls for most agricultural insect pests. But human nature permits lapses of vigilance, and failure to use available materials at the most effective time. Thus insect populations increase far beyond necessary proportions. Local dealers still face the problem of keeping in stock adequate supplies of insecticides to meet almost any emergency.

LIVESTOCK raisers in many parts of the country are becoming more and more aware of the potentialities of DDT and other insecticides in the fattening of cattle, according to reports of broadening activity along this line. Ray L. Cuff of Kansas City, one of the country's foremost advocates of mass DDT treatments on cattle, in last month's *Agricultural Chemicals* reported gratifying results of such experiments in Kansas and Texas. The movement now spreads northward, it seems, to include herds of cattle in Iowa and other midwestern states.

Harold Gunderson, Iowa State College Extension Entomologist, speaking at a recent "DDT Field Day" at Keota, Iowa, said that a half-million Iowa cattle have been sprayed with DDT to control flies this year, and that every cattle owner contacted has reported satisfactory results. Similar results were reported by Clyde A. Bower, Oklahoma state entomologist, in whose state fly control tests were also made.

This activity among cattlemen is another example of the broadened trend in insecticide consumption—a trend which indicates the current production rate of 50,000,000 pounds of basic DDT annually is in no sense a "flash in the pan."

A guest editorial written especially for this issue of Agricultural Chemicals

Standardization the need in Agricultural Chemical Field

By Hon. Willard H. Allen
Secretary of Agriculture
State of New Jersey

WHILE it is conceded that much of the recent rapid growth of the insecticide industry can be attributed to the demands of the war period, an orderly conversion to peacetime activities and even further expansion can be anticipated. Those directly concerned with agriculture, as well as the general public, already have exhibited a keen interest in new materials and more efficient methods for using them.

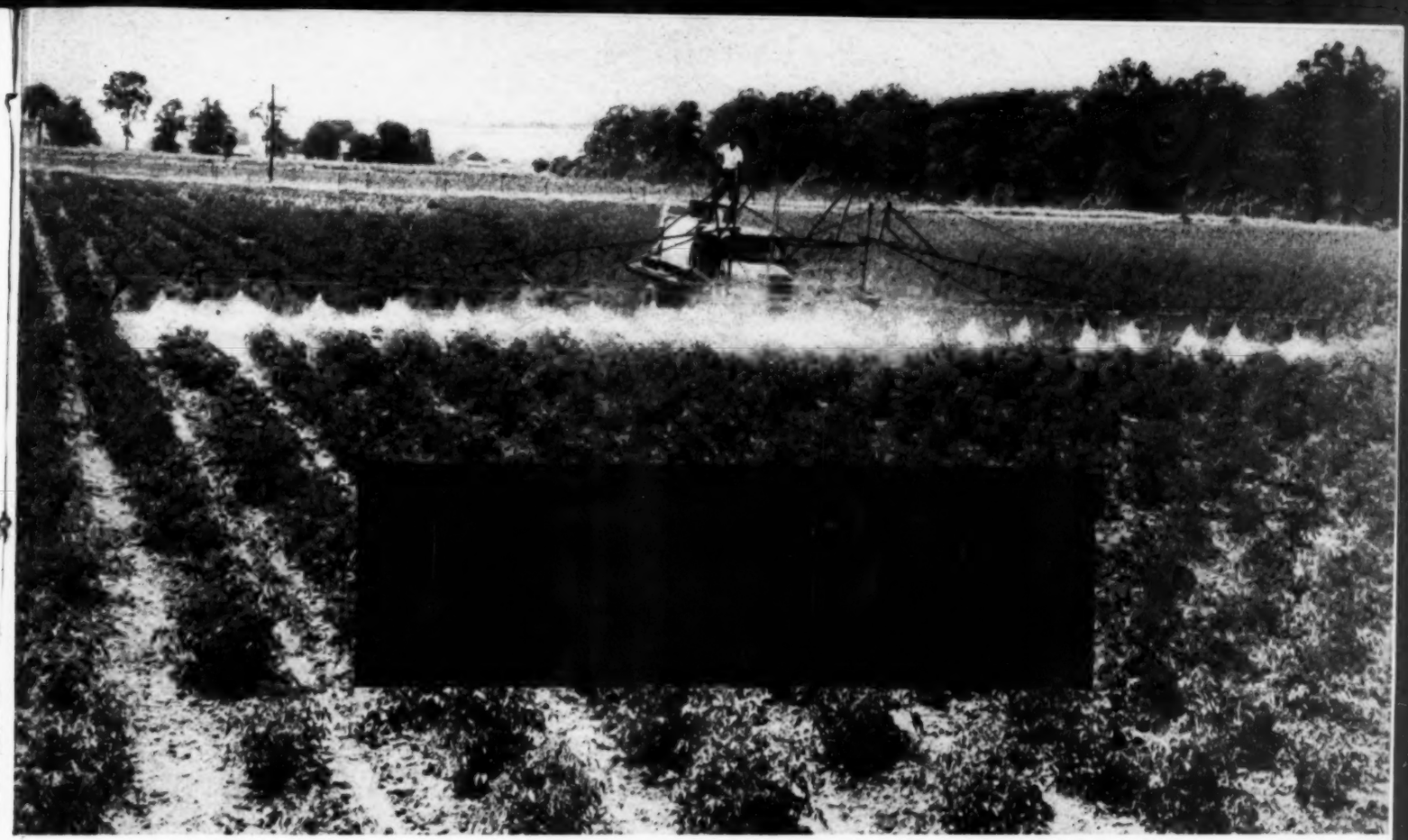
This favorable situation is a tribute to the research workers and leaders of your relatively new industry. The remarkable progress achieved has won public recognition in the fields of human welfare and food production. Such good will is an almost priceless asset which will be a distinct advantage to this young but mature industry now facing a promising future.

A few observations by a layman as to future developments in the insecticide field may be of interest to the industry. The efforts to secure more uniformity in insecticide, fungicide and pest control laws are to be commended. The willingness of both state officials and representatives of the trade to meet on common ground promises a practical solution to what has been a difficult situation for all concerned. Prompt adoption of model and standardized legislation is imperative now just at the time the industry faces an era of expansion.

Experiences related to me by both commercial farmers and amateur gardeners prompt the suggestion that some standardization in nomenclature of insecticides and fungicides would be welcomed by the public. In making this observation it is acknowledged that, although the hasty introduction of some of the wartime products did not permit full consideration of the need for simple and informative labels, there will be little excuse in future years for adding to the confusion now confronting those who are your customers.

A visit to any farm supply dealer or suburban hardware store presents a wide assortment of trade marks, chemical terms, symbols, abbreviations, initials, numbers and fantastic combinations that are awkward and bewildering both to the clerk behind the counter and the prospective buyer. Further confusion often results from an effort, no matter how sincere, to study and follow

(*Turn to Page 60*)

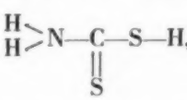


By Dr. S. E. A. McCallan
Boyce Thompson Institute for Plant Research, Inc.
Yonkers 3, New York

THE group of fungicides derived from dithiocarbamic acid are at present the most important and versatile of the organic fungicides. They have given good performance in the control of many different types of plant diseases in such varied fields as foliage sprays, seed treatments, and turf fungicides. In addition they have insect repellant properties and thus can qualify as insecticides. As non-agricultural fungicides they have been used for the control of skin diseases of humans and animals and as preservatives of textiles, paints, and other products.

The fungicidal properties of this most interesting group of organic sulfur compounds was discovered in 1931 by Tisdale and Williams of the du Pont laboratories while exploring for possible insecticides and fungicides. These compounds, although having new applications as fungicides and insecticides, had been employed extensively in the rubber industry to accelerate the vulcanization process, and this use probably hastened their discovery as fungicides.

The foundation compound of these materials is dithiocarbamic acid.



$$\begin{matrix} H \\ H \end{matrix}\!\!>\!N\!-\!C\!-\!S\!-\!H$$
$$\quad\quad\quad

by means of laboratory slide-germination tests. Unlike the other three compounds which are relatively water insoluble, although readily water suspendible when properly conditioned, this chemical is water soluble but forms a water insoluble film upon drying. In the fungicide trade disodium ethylene bisdithiocarbamate is known under the name of "Dithane."

The four derivatives of dithiocarbamic acid described above are at present the only ones of any practical importance used as fungicides, although a fifth chemical, morpoholine thiuram disulfide, has been tried in very limited tests. While undoubtedly a considerable amount of research has been done on the fungicidal properties of various other derivatives, especially by the interested industrial laboratories, only limited information is generally available. Some early studies have been made in England.

However, the most extensive work is that of Goldsworthy, Green, and Smith in the U. S. Department of Agriculture. These workers studied various metal dialkyl dithiocarbamates both in the laboratory and on plants in the field. Included were the sodium, ferric, lead, zinc, copper, silver and mercury dimethyl, diethyl, and dibutyl dithiocarbamates and selenium diethyl dithiocarbamate.

In general sodium, selenium, copper and mercury salts were phytotoxic and damaged all plants tested, the iron, zinc, and silver salts were variable, and the lead salts caused no injury. The dimethyl derivatives appeared to possess the greatest fungicidal value and the dibutyl derivatives the least. The general conclusion was that the lead, iron, and zinc dimethyl derivatives offered the greatest promise as fungicides for use on plants.

Various trade names of fungicides appear in this article. For the benefit of readers, here are the names of manufacturers:

"Methasan"
Monsanto Chemical Co.
St. Louis, Mo.

"Dithane"
Rohm & Haas Co.
Philadelphia

"Spergon"
U. S. Rubber Co.
(Naugatuck Div.)
New York

"Nomersan"
Imperial Chem. Industries, Ltd.,
England

"Arasan", "Fermate",

"Milban", "Tersan",

"Thiosan", "Zerlate"
E. I. duPont de Nemours & Co., Inc.
Wilmington

More recently some restricted field tests on potatoes and tomatoes by others indicate that the Ca, Na, Cu, Ni, and Pb salts are less effective than the Zn and Fe.

The heavy metal dimethyl dithiocarbamates are slightly soluble in distilled water at room temperature to the extent of 120 p.p.m. for the ferric salt and 65 p.p.m. for the zinc salt. However, the metallic dithiocarbamates when used as fungicides require appropriate conditioning agents to bring about the desired wettable and dispersible properties. Unfortunately the dithiocarbamates are somewhat unstable; the dialkyl dithiocarbamates oxidize very readily. It is said that the most usual course is the elimination of the dissociable hydrogen from each of two molecules, which then combine to form the insoluble tetraalkylthiuram disulfide. All four of the commercially important dithiocarbamic acid derivative fungicides possess a high order of tenacity and stick well when sprayed or dusted on to plants or seeds. The addition of zinc sulfate and lime to disodium ethylene bisdithiocarbamate by Heuberger and Manns has markedly improved its protective value. Recently the reaction product of disodium ethylene bisdithiocarbamate and zinc sulfate has been prepared, namely zinc ethylene bisdithiocarbamate; its high fungicidal value is thus shown.

A field of Chinese Cabbage, revealing great difference in plant health between those treated with "Fermate" (left) and the untreated control plot at the right. Treatment was for control of club root, fungus disease. (Photo on this page and one on next courtesy of Canadian Industries, Ltd.)

Cauliflower plants treated with "Fermate" (ferric dimethyldithiocarbamate) against club root disease are seen at left, untreated plot at the right. Treatments of these plants and cabbage were made by suspending "Fermate" in water (2½ lbs. to 100 gallons) and dipping the seedlings at the time of transplanting.

In common with many other sulfur compounds these materials show a tendency to cause dermatitis in a small percentage of humans. This is particularly so in the case of dust preparations. There is no evidence that any of the materials will constitute a residue problem.

It was only a few years ago that the first of these compounds, tetramethylthiuram disulfide and ferric dimethyl dithiocarbamate, became generally available to the experiment station workers for test purposes. Beginning in 1942 reports began to appear on results attained with these new materials. These reports have rapidly increased in number so that we now have a reasonably good idea of the advantages and limitations of these two compounds as fungicides. Of course it is natural that in time further applications will probably be discovered.

The other two chemicals, disodium ethylene bisdithiocarbamate and zinc dimethyl dithiocarbamate, being more recent developments, do not present as clear a picture. However, information also is rapidly accumulating on them and it appears that they will have important agricultural uses. The most recent summary of the performance of these and other new organic fungicides has been compiled for nation wide data in 1945 by the Fungicide Committee of the Potomac Division of the American Phytopathological Society. It is to be hoped that a similar compilation will be available for the 1946 results.

Seed and Turf Treatments

TETRAMETHYLTHIURAM disulfide as a commercial fungicide has been available in several forms. Two of these contain 50 per cent of the active chemical, the wettable form called "Thiosan," more recently "Tersan," which has been developed primarily for the control of turf diseases, while the non-wettable form known as "Arasan" is applied as a dust treatment for seed protection. An English product is called "Nomersan." In the control of the turf diseases, brown patch, and dollar spot, "Thiosan" has given satisfactory results, comparable to that attained by the organic mercury treatments. More limited data indicate that "Thiosan" may also be successful in controlling various other turf diseases. During the war years and after when mercury has been very scarce the tetramethylthiuram disulfide fungicide has filled a very definite need.

Dry applications of tetramethylthiuram disulfide in dust form have been used successfully on a number of different seeds as well as other plant parts. One use has been in the south on peanut seed to increase the stand of plants. The dust treatment is especially effective on injured machine shelled seed which is more subject to attack by soil fungi. The trade-mark name "Arasan" was in fact derived from the generic name of the peanut, *Arachis*.

The tests with the newer organic fungicides as vegetable seed treatments have been fairly extensive largely because of the excellent cooperative studies by the vegetable seed treatment sub-committee of the seed treatment committee of the American Phytopathological Society. This committee has directed cooperative tests since 1940 in a large number of states and Canadian provinces on the seeds of a dozen or so different crops. Independent workers have also been active, and as a result it can be seen that tetramethylthiuram disulfide in dust form. i.e., "Arasan," has an important place in the treatment of vegetable seeds. For the general control of seed decay and damping off "Arasan" is probably the best treatment for beet, sweet corn. and tomato seed and among the best for carrot, cucumber and other cucurbits, spinach and Swiss chard. It is also good on cabbage and other cruciferous seed as cauliflower and radish.

On onion seed "Arasan" with a sticker has given damping-off control equal to the standard formaldehyde solution method in addition to being much less laborious.

In the case of legume seeds, however, such as peas, lima beans and snap beans, while "Arasan" gives good control about equal to the organic mercury fungicides it is generally surpassed by tetrachlorobenzoquinone ("Spergon"). An outstanding advantage of "Arasan" is that its tendency to injure seed is much less than that of the organic mercury treatments nor does it have any specific deleterious effect on certain groups of seeds such as cuprous oxide on the cruciferous seeds. Treated seeds may also be stored for long periods without injury from the chemical.

The greatest disadvantage of "Arasan" dust is its irritating effect upon certain persons, which in some cases has probably prevented its use in large amounts. Ferric dimethyl dithiocarbamate ("Fermate") has also been employed as a vegetable seed treatment in some instances and has given good control; however, in most cases "Arasan" would be considered preferable. All in all among the various vegetable seed protectant dusts "Arasan" is considered the most consistently effective.

In the treatment of field seeds we have less information; however, in the case of corn, limited data from the midwest and south indicate that "Arasan" along with "Spergon" may equal the standard organic mercury treatments. Under unfavorable conditions of cold, wet soil and injured seed, they appear particularly promising in the control of seed decay and increasing seedling stand. Flax seed, especially when injured from mechanical threshing, is subject to decay from seed borne and soil diseases, and tetramethylthiuram disulfide dust ("Arasan" and especially in Northern Ireland, "Nomersan") has given good control in some instances though the organic mercuries often appear superior. Soybean seed treatments with "Arasan" and other protectant chemicals have been tried in cooperative and individual tests. Variable results have been obtained though in some cases "Arasan" has appeared very promising. In general, however, at the present time seed treatment of field soybeans is not yet recommended.

The possible use of tetramethylthiuram disulfide dusts has been shown for increasing seedling stands of such crops as castor bean and sugar beet. In fact there are many isolated reports showing the favorable use of these materials on various seeds and other plant parts. However, more information is desirable.

The dithiocarbamate fungicides have not proved effective in treating seed grain such as oats and barley where infective material is covered by the glumes. Here it is necessary to use volatile compounds such as ethyl mercury phosphate.

Fruit Sprays

THE metallic dithiocarbamates, i.e. ferric, and zinc dimethyl dithiocarbamate, and disodium ethylene bisdithiocarbamate, have been used primarily for the control of orchard and vegetable diseases. "Fermate" in particular has been tested rather extensively as an orchard fungicide. There is less information on the other two chemicals since their use as fungicides is more recent; however, it seems probable that they will be most suitable on vegetable crops.

As an apple spray "Fermate" and may in some cases replace the standard sulfur treatments. "Fermate" has generally proved very effective and is compatible with lead arsenate, lime, summer oils and DDT. Actually it appears to act as a safener for lead arsenate, lessening its tendency to russet. The regular sulfur and copper fungicides can not be used with summer oils. While "Fermate" controls scab fairly well, it is surpassed in this respect by the new phenylmercurictriethanol ammonium lactate fungicides. However, against rust, "Fermate" is notably outstanding. It has controlled blotch, bitter rot and frogeye leaf spot as well as or better than Bordeaux. An objectionable feature of "Fermate" is its black residue. In results so far zinc dimethyl dithiocarbamate in the form of "Zerlate" or "Methasan," and disodium ethylene bisdithiocarbamate ("Dithane") are generally inferior to "Fermate" on apples and tend to be somewhat injurious.

On pears "Fermate" has given good results, especially in the far west where it controlled scab on sulfur sensitive varieties without fruit russetting. The dithiocarbamate sprays used to control leaf spot defoliation of cherry have not in general improved upon the standard treatments and are inferior to the glyoxalidine derivatives; also for the control of brown rot of cherries, peaches and plums they have not exceeded the standard sulfur. For the control of cranberry fruit rots "Fermate" has been very successful and much better than Bordeaux.

Tests in controlling foliage diseases of various other fruits as well as ornamentals and shade trees indicate other effective uses for the dithiocarbamate fungicides. For example as might be expected, "Fermate" gives good control of carnation rust.

Vegetable Sprays and Dusts

FOR over 50 years plant pathologists and chemists have been trying to improve upon Bordeaux mixture as a potato spray. For a while it appeared that this had been accomplished with one of the dithiocarbamic acid derivatives, namely "Dithane." In southern Florida phenomenal control of late blight and sharply increased yields of potatoes were obtained with "Dithane" plus zinc sulfate and lime. Unfortunately such outstanding performance has not been observed in the north. In general it appears at present that "Dithane" plus zinc sulfate and lime is superior to the "fixed" copper fungicides and to the other new organic preparations used on potatoes in the control of late and early blights and in tuber yield. Bordeaux, however, remains equal or better in the control of late blight. "Dithane" gives good control of leafhoppers and when used with DDT gives excellent results. As a potato spray zinc dimethyl dithiocarbamate ("Methasan," "Zerlate") is definitely superior to the ferric salt ("Fermate") in the control of early and late blights as well as leafhoppers. "Methasan" and "Zerlate" indeed appear to equal "Dithane" in early blight control.

In the control of tomato diseases somewhat similar results hold.

(*Turn to Page* 55)

Hexaeth[redacted]

By T. E. Bronson and S. A. Hall

U. S. Dept. of Agriculture, Agr. Res. Adm., Bureau of Entomology and Plant Quarantine

HEXAETHYL tetraphosphate is the toxic ingredient of a synthetic contact insecticide developed in Germany as a substitute for nicotine and used there during the war. The name "Bladan" was given to a mixture containing 60 per cent of hexaethyl tetraphosphate, 20 per cent of toluene, and 20 per cent of an emulsifier (Hall *1*). One of the authors (Mr. Hall) obtained some of this material while on a trip to Germany in 1945. The German product and also hexaethyl tetraphosphate which was synthesized at Beltsville, Md., were used in greenhouse tests against the cabbage aphid and the pea aphid at Madison, Wisconsin. The results of these preliminary tests, together with some of the salient chemical characteristics of the ester and its laboratory preparation are reported here.

Preparation and Properties

A SIMPLE but rather unusual reaction is involved in the preparation of hexaethyl tetraphosphate:

$$POCl_3 + 3(C_2H_5)_3PO_4 \rightarrow (C_2H_5O)_6P_4O_7 + 3C_2H_5Cl$$

From this equation it is seen that ethyl chloride is a byproduct in the reaction.

A 1-liter, 2-necked, round-bottom flask, heated by a hemispherical heating mantle, was fitted with a thermometer, reflux condenser, and a tared, dry-ice trap at the top of the condenser. A mixture of 153 grams of phosphorus oxychloride (1 mole) and 550 grams of triethyl phosphate (3 moles) was placed in the flask, which was gently heated until the temperature of the reaction mixture reached 140°C. The heat was shut off at this point, and the reaction proceeded exothermically with the temperature rising to 152°C. Ethyl chloride, which was evolved rapidly, was condensed in the dry-ice trap. When the vigor of the reaction had subsided, heating was continued for 15 minutes longer at a temperature not exceeding 145°. When the temperature of the reaction mixture had dropped to 130°, the dry-ice trap containing ethyl chloride was removed and a vacuum of about 100 mm. of mercury was applied to the system to remove traces of hydrogen chloride. The ethyl chloride weighed 19.6 grams (theory 19.4 grams).

The reaction product, a light amber-colored oily liquid, weighed 499.5 grams, which is 99 per cent of the theoretical yield of hexaethyl tetraphosphate. It does not appear necessary to attempt further purification of the ester. An attempted vacuum distillation of a portion of the product resulted in decomposition with the evolution of ethylene.

The unrefined hexaethyl tetraphosphate gave the following values for refractive index and density:

$${}^{n}D^{27} = 1.4273 \qquad D_4^{27} = 1.2917$$

These values in the Lorenz-Lorentz equation gave a molecular refraction $^{M}D = 100.7$. The calculated molecular refraction, using the refractivity data for organic phosphorus compounds derived by Jones *et al.* (*2*), is $^{M}D = 102.9$. The agreement is rather good for an unrefined reaction product.

Zeisel ethoxyl determination: Calcd. for $(C_2H_5O)_6P_4O_7$, 53.4% Ethoxyl; found, 50.9%.

Saponification equivalent: Calcd. for 4 equivs. 506.3; found, 505.6.

Phosphorus determination as $Mg_2P_2O_7$: Calcd. for $C_{12}H_{30}O_{13}P_4$, 24.5% P; found, 25.2%.

The ester is miscible in all proportions with water, alcohol, acetone, ether, diacetone alcohol, ethyl acetate, glycerol, chloroform, chlorobenzene, carbon tetrachloride, benzene, toluene, xylene, and alkylated naphtha-

(1) Hall, S. A. 1945. Insecticides, insect repellents, rodenticides, and fungicides of I. G. Farbenindustrie . . . Office of the Publication Board, U. S. Dept. Com., PB. 252, 48 pp. [Processed.]

(2) Jones, W. G., Daies W. C., and Dyke, W. J. C. 1933. Refractivities of liquid compounds of phosphorus. Jour. Phys. Chem. 37: 583-596.

lene. It is insoluble in ligroin, and in kerosene. The product is evidently stable at ordinary temperatures in the absence of moisture. After 6 months no change in refractive index or density was observed. It is, however, readily hydrolyzed in aqueous solution, and this fact was claimed by the Germans (1) as an advantage, since the hydrolysis products are presumably non-toxic and thus a spray-residue problem may be obviated. Preliminary studies indicate that the ester is not hydrolyzed appreciably, even in boiling water, to phosphoric acid, but is partially hydrolyzed to intermediate products of yet undetermined composition. The hydrolysis rates of this ester at several temperatures are under investigation.

Tests on Metal Corrosion

HEXAETHYL tetraphosphate in the absence of water did not appreciably corrode strips of brass or iron. However, in the presence of a small proportion of water a very strong acid was formed at once which rapidly attacked galvanized iron; it also attacked iron but at a much slower rate; it did not attack brass appreciably.

A water solution containing 0.1 per cent hexaethyl tetraphosphate (pH = 2.45) did not appreciably corrode strips of brass and iron after 106 hours at 25–30°C. The iron strips, in the presence of air, were slightly rusted but no more so than by the action of distilled water alone. During the first 18 hours 0.1 per cent hexaethyl tetraphosphate inhibited the rusting of the iron strips as compared to the action of the water alone. The galvanizing of #18 gage galvanized sheet strips was only slightly attacked after 106 hours at 25–30°C.

A water solution containing 1.0 per cent hexaethyl tetraphosphate (pH = 1.54) did not appreciably corrode strips of brass after 106 hours at 25–30°C. Iron strips, in the presence of air, were appreciably rusted after 18 hours at 25–30°C. Galvanized iron was rapidly attacked at this concentration. After 4 hours at 30°C. approximately 60 per cent of the galvanizing was removed.

Tests Against Aphids

THE greenhouse tests at Madison were made with the original German product, "Bladan," and two samples prepared at the Beltsville laboratory, (1) pure hexaethyl tetraphosphate and (2) a mixture similar to "Bladan" containing as emulsifier a proprietary product consisting of polyethylene glycol monoisoctyl phenyl ether (called Bureau mixture in this paper). These three materials in the form of atomized aqueous solutions and dust mixtures were tested against the cabbage aphid (*Brevicoryne brassicae* (L.)) and the pea aphid (*Macrosiphum pisi* (Kltb.)) Comparative tests were made with solutions and dusts containing nicotine.

Tests Against the Cabbage Aphid

IN the first series of tests infested cabbage leaves were placed in a testing chamber of 21¾ cubic foot capacity and a measured quantity of dust was blown into the chamber and allowed to settle for 2 minutes. By this method all the aphids were fully exposed to the insecticide.

In the second series of tests a measured quantity of dust was discharged into the chamber and 15 seconds were allowed for the larger particles to settle. Then infested cabbage plants (with four to six leaves per plant) were quickly introduced through the floor of the chamber by means of a pneumatic lift. Counts of dead and living aphids were made at 24 and 48-hour intervals, but as the mortality after 48 hours was substantially the same as after 24 hours, only the data for 24 hours are given. The results are presented in table 1.

In the first series (table 1) in which aphids entirely exposed on leaves were treated, "Bladan" was highly effective when freshly mixed but had lost all of its toxicity when 7 to 10 days old. The pure material also was highly effective when freshly mixed and only slightly less toxic when 7 to 10 days old. The nicotine dust, used as a check, was prepared when the first tests were started and the same mixture was used effectively throughout, without apparent deterioration.

In the second series where entire plants were treated, "Bladan" was not employed because of its rapid deterioration, as evidenced in the first series. Under the more severe conditions of this test where the aphids were protected by leaves, the freshly prepared pure hexaethyl tetraphosphate again gave high mortality. Rapid deterioration occurred in the material 2 to 5 days old as shown by the low kill by the "aged dust mixtures." Hydrated lime apparently aided the deterioration. Nicotine dust was less effective here than in series 1.

In another series, (table 2)

Table One

Results of Tests with hexaethyl tetraphosphate and nicotine dust mixtures against the cabbage aphid at an average temperature of 67°F. All materials contained 3 per cent of the toxicant.

Series 1—Single cabbage leaves treated. Dosage 750 mg. of dust.

	Fresh dust mixtures		*Aged dust mixtures*[1]	
Treatment	*Number of aphids*	*Per cent mortality in 24 hrs.*	*Number of aphids*	*Per cent mortality in 24 hrs.*
Hexaethyl tetraphosphate:				
Bladan-talc	275	100	200	0
Pure material-talc	375	100	100	87
Nicotine sulfate-hydrated lime	450	98	—	—
Check, untreated	380	0	—	—

Series 2—Entire cabbage plants treated. Dosage 2 gm. of dust.

Hexaethyl tetraphosphate:				
Pure material-talc	225	100	900	50
Pure material-hydrated lime	850	94	600	15
Nicotine sulfate-hydrated lime	250	60	—	—
Check, untreated	950	0	—	—

[1] Aged dust mixture used in series 1 was 7 to 10 days old, that in series 2 was 2 to 5 days old.

Table Two

Results of tests with atomized aqueous solutions of hexaethyl tetraphosphate (Bureau mixture) and nicotine against the cabbage aphid on potted cabbage plants, at an average temperature of 68°F. Dosage 5 cc. per plant.

Treatment	*Per cent of toxicant*	*Number of aphids*	*Per cent mortality in 24 hours*
Hexaethyl	0.6	1,000	88
	1.2	800	90
	2.4	1,200	92
Nicotine sulfate[1]	0.4	1,000	8
	0.8	800	13
Check, untreated	—	275	0

[1] The emulsifier (polyethylene glycol monoisoctyl phenyl ether) employed in the Bureau mixture was also used in this preparation.

aqueous solutions containing hexaethyl tetraphosphate (Bureau mixture) and nicotine sulfate were compared. They were discharged in a finely atomized form into the testing chamber so that very small quantities of solution actually came in contact with the aphids. The solution was discharged into the chamber and 15 seconds were allowed for the larger droplets to settle, after which entire infested plants were introduced for a 2-minute exposure. Results are presented in table 2.

At concentrations of 0.6, 1.2, and 2.4 per cent toxicant, the hexaethyl tetraphosphate was fairly effective. Nicotine as an atomized solution was not effective at either concentration employed.

In certain tests not shown here, in which entire infested cabbage plants were first placed in the chamber and then exposed to a full 5-cc. dosage of atomized solution for 2 minutes, the resulting aphid mortalities with the hexaethyl tetraphosphate ranged from 90 to 98 per cent even at dilutions as high as 1-1000. No foliage injury was observed in any of these tests.

Tests Against the Pea Aphid

IN these tests single pea plants were manually infested with 15 adult aphids and, after 15 seconds was allowed for larger particles of dust or droplets of the solutions to settle, the plants were introduced into the chamber for a 2 minute exposure. Results are presented in table 3.

When tested in dust mixtures, "Bladan" gave low mortality. The pure material was highly effective, and the Bureau Mixture fairly so. When applied 3 days after mixing (data not shown), the effectiveness of all three mixtures was reduced approximately 25 per cent, and when applied 10 days after mixing, practically no toxicity resulted.

In the tests with atomized aqueous solutions, only the Bureau mixture at concentrations of 1.2 and 2.4 per cent toxicant was fairly effective. No foliage injury was observed in any of these tests.

Discussion

ON THE basis of these preliminary greenhouse tests it is evident that freshly mixed hexaethyl tetraphosphate dust mixtures offer promise for cabbage aphid control. The exact length of time that they can safely be stored before use must be determined by preparing larger quantities and testing them under field conditions.

Hexaethyl tetraphosphate may deteriorate more rapidly in solutions than in dust mixtures, but since solutions are customarily applied as soon as prepared or diluted for use, it is believed that they may prove to be more satisfactory than dusts.

It should be emphasized that in these tests the solutions were atomized into a chamber at temperatures slightly below 70°F. and allowed to settle onto the aphids which were not wetted as with conventional sprays. This evidently accounts for the unusually low mortalities obtained with the nicotine solutions.★★

Table Three

Results of tests with hexaethyl tetraphosphate and nicotine solution and dust mixtures against the pea aphid on potted pea plants at an average temperature of 68°F. Dusts freshly mixed with talc, dosage 2 grams per plant. Dosage of solution 5 cc. per plant.

Treatment	*Per cent of toxicant*	*Number of replicates*	*Per cent mortality in 24 hours*
		Aqueous Solutions	
Hexaethyl tetraphosphate:			
Bladan	0.6	8	8
Bureau mixture	0.3	4	7
	0.6	20	54
	1.2	16	89
	2.4	4	94
Nicotine alkaloid	1	12	4
	2	8	3
Check, untreated	—	8	0
		Dust Mixtures	
Hexaethyl tetraphosphate:			
Bladen	3	8	36
Pure material	3	12	99
Bureau mixture	3	12	90
Check, untreated	—	16	0

of

ED TREATMENT

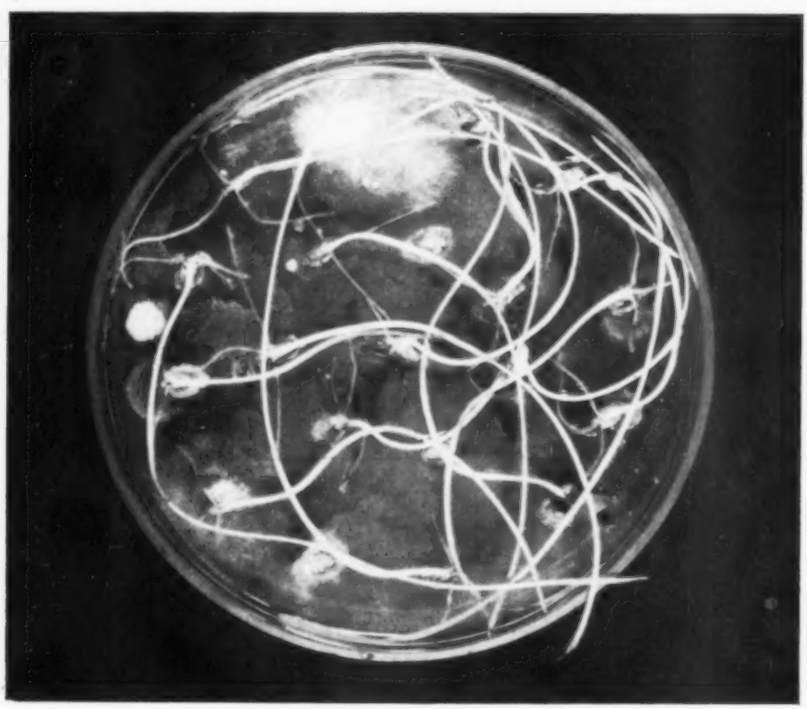
THE application of chemicals to seeds before planting to prevent certain plant diseases is an agricultural practice dating back to the middle of the 17th century. Doubtless much earlier than that the Egyptians, Syrians, Greeks, and Romans beseeched their gods to do something about the smuts, rusts, and blights that even then must have caused serious crop losses. So far as we know, however, the first chemical used to any considerable extent as a seed treatment for the control of a seed-borne plant disease was salt, extracted from sea water or brine by the farmer himself.

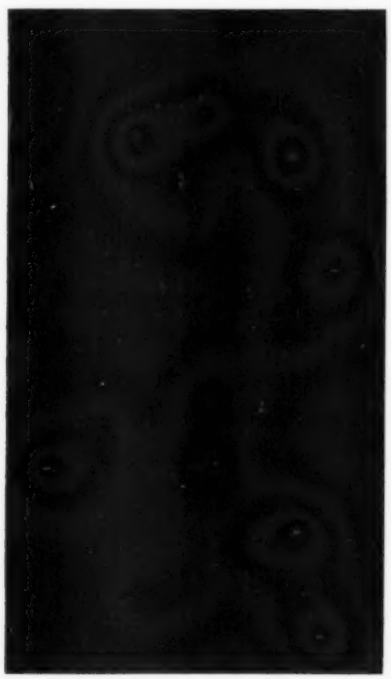
Lye

The more progressive wheat growers of 17th-century Europe practiced the brining of seed wheat to control stinking smut, or bunt as they called it, until Matthieu Du Tillet, who had as his vocation the directorship of the mint of Troye, France, and as his avocation the study of botany, recommended a more effective treatment. It involved washing the seed with water, drying it, washing it with a solution of lye, drying it again, sprinkling it with lye solution, and finally sprinkling it with lime. The results of his experiments so impressed His Majesty Louis XV that he ordered Tillet's directions for the control of wheat smut printed and distributed to the farmers throughout his kingdom. Time consuming, laborious, and probably only partially effective—such was the first officially recommended chemical seed treatment—in 1775.

Copper Sulfate

It was not until more than 60 years later that a more effective seed





By G. F. Miles
E. I. du Pont de Nemours & Co., Inc.

wheat treatment was advanced by Benedict Prevost, a Swiss botanist. He had correctly ascertained the causal agent of smut as a fungus, and had properly ascribed to the black dust (fungous spores) on the seed the means by which the disease appeared year after year in the fields. Importantly, too, he had found in his studies that a 1-10,000 dilution of copper sulfate would kill the spores. And thus a new chemical seed treatment, the bluestone soaking method, was launched. With modifications this was to be recognized for nearly a century as the standard method for controlling wheat smut.

Hot Water

In 1888 Jensen found that treatment of seed oats with hot water was an effective means of controlling smut. But the procedure was fraught with the danger of injury to the seed unless the temperature of the water was carefully controlled. The hot-water treatment is no longer used as a treatment for seed oats. The principle discovered by Jensen, however, is still utilized as a means of controling certain internally seed-borne diseases, such as the loose smut of wheat and black leg of cabbage.

Formaldehyde

Formaldehyde as a seed disinfectant entered the picture during the closing years of the last century, with several investigators in Europe and the United States as its sponsors. Large amounts of the chemical were used for many years for the treatment of seed grains and potatoes. Effective and inexpensive, it still finds favor in some sections of the U. S. and Canada.

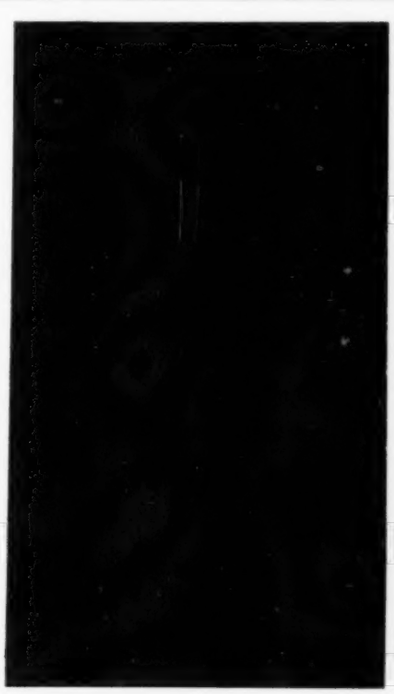
Copper Carbonate

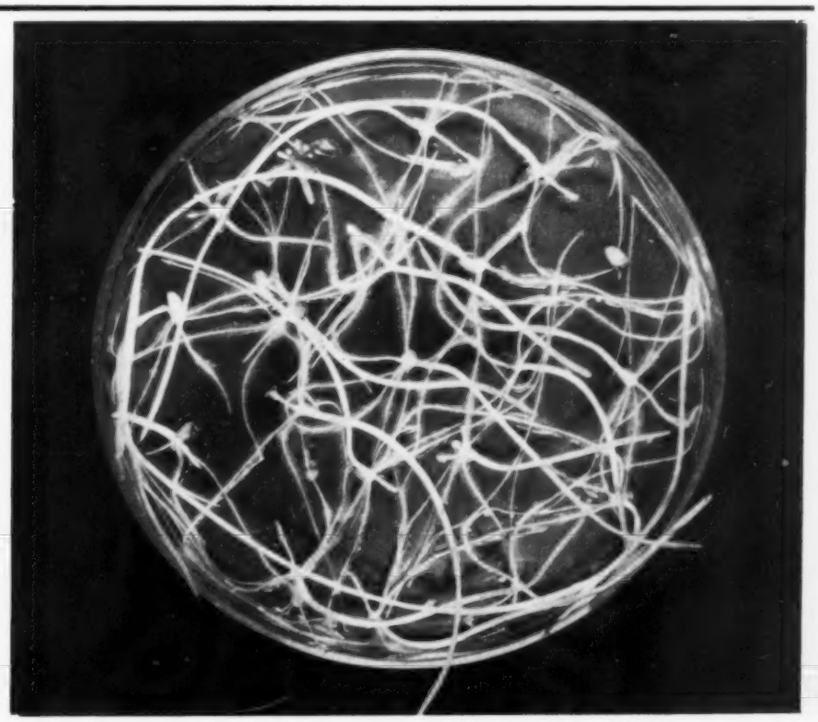
World War I brought the demand for more wheat to feed our armies and our allies. It brought also the first important departure from liquids, such as formaldehyde and copper sulfate solutions, as seed treating agents, and the introduction of the first widely used seed treatment for application as a dust or powder, namely, copper carbonate. Millions of bushels of seed wheat were treated with copper carbonate powder, and many an extra ship load of sound wheat thus rescued from the ravages of the stinking smut disease went to Europe to help win the war.

For several years formaldehyde solution and copper carbonate powder occupied the stage as the standard treatments for the grain seeds—wheat, oats, and barley. The copper salt was used chiefly on wheat, but formaldehyde, because of its volatility, was the more suitable of the two compounds for the treatment of seeds with hulls, such as oats and barley.

Organic Mercurials

A few years after copper carbonate came into the picture in 1917, biologists began examining some of the many organic compounds of mercury, and became familiar with the chlorophenol and nitrophenol mercuries, and later cresol mercury. The efficacy of the inorganic mercuric chloride as a fungicide and bactericide





had been known for many years, but the use of that chemical had been limited to the treatment of seed potatoes and certain vegetable seeds.

Continued research in the field of organic mercurials uncovered the most effective and most versatile seed treatments so far developed — the ethyl mercury salts. Their high degree of toxicity as fungicides and bactericides and the extent to which they are tolerated by seeds made them admirably suited for the treatment of many sorts of seed. Their discovery expanded the field of seed treatment rapidly, both in the United States and in foreign countries.

While the ethyl mercury compounds have dominated the field for the past several decades, other chemicals have also come in for attention. Cuprous oxide, zinc oxide, and zinc hydroxide were found to possess valuable properties for the treatment of seeds, chiefly vegetable seeds. Phenyl mercury cyanamide has been developed and used primarily as a treatment for seed corn. In Europe tolyl mercury and methoxyethyl mercury salts were widely used as treatments for seed grains.

Non-Metallic Organics

SHORTLY before World War II, the trend of thought and research in the field of seed treatment turned toward non-metallic organic compounds. Stimulated in part by the fear that our supplies of mercury and other metals might be curtailed by the war, the search for non-metallic seed treatments was accelerated. This increased research activity has so far not been rewarded by the discovery and development of new seed treatments of the non-metallic type. True, we have tetramethyl thiuramdisulfide and tetrachloro-p-benzoquinone, but the effectiveness of these two compounds was known several years before the war began. Indeed, it would have been surprising if the modest increase in research activity directed toward the production of new and better seed treatments during the war period had met with marked success. Successful seed-treating chemicals, like most other fungicides and insecticides, are rarely the result of a brilliant idea flashing from the brain of a genius. Rather they are the result of the laborious, tedious, and monotonous examining, testing, comparing, and studying of thousands of new chemicals.

Of the many thousands of compounds examined by various research organizations in this country and abroad, only a few have been found even to approximate the desired requirements of new and better seed treatments. Hand the biologist five thousand compounds hitherto untested as seed treatments, and his chance of finding a better seed treatment among them are very poor.

Progress in the field of seed treatment, however, has not been restricted to the development of constantly improved seed-treating chemicals. Since the days of brining seed wheat and Tillet's lye method for the control of wheat smut, the practice of seed treatment has been expanded to include nearly all major crop seeds. When the fungicidal merits of formaldehyde were discovered, oats, barley, and seed potatoes, as well as wheat, were treated with the new seed-treating chemical by many growers. The development of inorganic and organic mercurials, copper and zinc compounds, and the non-metallic organics placed in the hands of the grower a variety of seed-treating chemicals. From the treatment of wheat, oats, barley, and seed potatoes, the practice of seed treatment has expanded to include nearly all vegetable seeds, bulbs, corn, flax, cottonseed, sorghum, sugar beet, peanut, soybean, and other crop seeds. In short, we now have effective seed-treating chemicals suitable for the disinfection and protection of the seeds of most of our major crops.

Disinfectants and Protectants

WITH this brief history of seed treatment as a background, suppose we examine the "why" and the "how" of seed treatment. The term "chemical seed treatment" is used here to refer to chemicals applied to seeds for the prevention of certain plant diseases. The diseases with which seed treatment is concerned are caused chiefly by fungi (molds) or bacteria (germs), which collectively we can describe as pathogenic (disease-producing) organisms.

These organisms may be found for the most part on the surfaces of the seeds and in the soil. Their numbers are countless. For example, a single kernel of wheat infested with the spores (reproductive bodies) of the stinking smut fungus may carry as many as 500,000 spores, any one of which may fulfill its mission by infecting the young wheat plant. An infected wheat plant usually produces nothing but worthless masses of smut spores instead of grain. To be effective, a seed treatment must be capable either of destroying all of those spores or preventing them from infecting the young wheat plant.

This is, however, not all that is expected of a successful seed-treating chemical. In addition to the pathogenic organisms carried on the surfaces of seeds, there are inconceivable numbers of harmful organisms in nearly all soils. Nature has equipped many of them with all sorts of tricky ways and means of surviving the winter's cold, and reviving in the spring, ready to attack the planted crop seed. These soil-borne parasites are responsible, among other plant ailments, for the rotting of the seed, damping-off, seedling blights, and root rots, all of which add up to heavy losses for the farmer.

The destruction by chemical seed treatment of organisms on the surface of the seed is usually described as seed disinfection or seed disinfestation, and the chemical used to destroy these *seed-borne* organisms is called a seed disinfectant or seed disinfestant. The prevention of attacks on the seeds and seedlings by *soil-borne* organisms is loosely referred to as seed protection and the chemical agent as a seed protectant.

As one might guess, some chemical seed treatments are better seed disinfectants than they are seed protectants, and some excellent protectants are almost worthless as disinfectants. Obviously the ideal seed treatment combines high efficiency in both categories.

"Many Called, Few Chosen"

Literally thousands of chemical compounds possess either or both seed-disinfecting and seed-protecting properties in some substantial degree. Most of them, however, cannot by

modern standards be rated as seed treatments, even though they may be highly efficacious in fungicidal and bactericidal properties.

The reason for this will be obvious from even a superficial examination of the qualifications demanded of a first-class seed treatment. Assuming that a chemical agent high in effectiveness against the parasitic organisms is discovered, it must be relatively harmless to the seeds on which it is to be used. In considering its phytotoxic properties (toxicity to seeds and plants), it must be remembered that farmers are usually not schooled in the technical accuracy of a scientific laboratory. Neither are they equipped with analytical balances. They often adhere to the fallacy that "if a little is good, a lot more is better." Our seed treatment then must be harmless to seeds not only at the recommended dosage, but at rates of application much higher.

The toxicity of the product to human beings engaged in the use of the chemical in large-scale seed-treating operations must be considered. The reports and recommendations of the toxicologist must be interpreted in the light of the conditions under which the product will be used. Many seed-processing plants are still inadequately provided with dust-exhausting equipment, and the hazards involved in the inhalation of the new product, as well as its accumulation on the mucous membranes and the skin, should not be overlooked.

Is the product stable? Will it deteriorate on the dealer's shelf? Has it an offensive odor? Is the color one that will not give a dull or unattractive appearance to the seed? Does it adhere well to the seed? Does it cause undue friction and interfere with the free flow of the treated seed through planting machinery? Can it be manufactured at a cost that will enable it to compete with products already on the market?

The ideal seed treatment supplying satisfactory answers to these and similar questions has not yet been developed. Obviously, then we must be satisfied with a seed treatment somewhat less than perfect. How much less than perfect is the question.

Role of Agricultural Officials

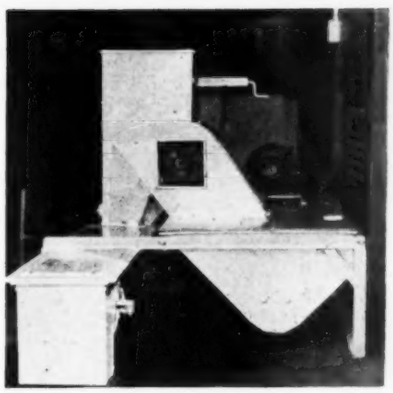
No discussion of this sort would be complete without an acknowledgment of the essential role played by many agricultural scientists, particularly in the United States Department of Agriculture, Agricultural Extension Service, and State Experiment Stations. They have contributed mightily to the development of chemical seed treatments and to the education of the farmer in their use. In fact, the best efforts of commercial organizations would have been unavailing in selling the advantages of seed treatment to American farmers, had it not been for the powerful impetus given to the practice by official research and extension forces in agriculture. Incidentally, these agencies still serve to guard the grower against losses he might incur from the presence on the market of ineffective, untested, and otherwise unsatisfactory seed treatments.

The Future of Seed Treatment

ANY French husbandman who was a subject of Louis XV and who tediously followed Matthieu Tillet's directions to wash his seed wheat with water, dry it, wash it with lye solution, dry it, sprinkle it with lye solution, and then with lime would be amazed to see seeds of all sorts being treated with a modern seed treater at the rate of 300 or more bushels per hour. There are indications just coming over the horizon, however, that even within the next decade or two we may look back with a tolerant smile at the inadequacy and inefficiency of present day seed-treating chemicals and methods.

The Slurry Method

FOR example, the recent announcement of the slurry or aqueous-suspension method of treating seed corn may be indicative of what lies ahead in the field of seed treatment. At first glance, the slurry method, involving the use of water, appears to be reactionary and to constitute a return to the wet or soaking methods used prior to the advent of copper carbonate and mercurial dusts. The quantity of water applied to the seed corn by the slurry method, however, is only about one-half of one per cent of the weight of the seed. This amount of water, equal to about ¼ pint per bushel of seed corn, is so small that slurry-treated seed is not even noticeably damp. The new method employs water merely to facilitate distribution of the disinfectant over the surfaces of the seed, and not to soak the seed.



A new seed treater of the slurry type designed to apply chemicals in the form of water suspensions rather than as powders.

Method Not New

THE slurry treatment of seed corn is by no means revolutionary. It still employs a chemical to disinfect and protect the seed just as do the seed treatments applied by the dust method. The substitution of water for talc or some other inert, employed to condition and distribute the active ingredient, provides, however, two very important improvements over present seed-corn treating practices.

First, the slurry method completely eliminates flying dust during seed-corn treating operations. Since tetramethyl thiuramdisulfide, the chemical used in the slurry treatment of seed corn, is non-volatile, this new method obviates the need for dust-exhausting equipment, respirators, and other safety devices. It reduces almost to zero the hazardous and disagreeable features of treating seed corn.

A second advantage of the slurry method is the accuracy of the dosage of chemical applied. The treating machine developed for the slurry treatment of seed corn synchronizes the flow of the corn and the

(*Turn to Page* 46)

e Dipping

By Milton A. Lesser

YEAR in and year out, the livestock industry is confronted with the major economic problem of combatting insects and related harmful pests. Indeed it has been said that in some parts of the country insects determine the success or failure of stock raising. Experience has shown that when large numbers of animals are to be treated, submerging the infested stock in an insecticidal solution is the only practical method of controlling certain external parasites.

For example, the dipping vat is classed (1) as the best and cheapest means of applying tick-destroying solutions. Dipping so that the animal is completely immersed in a suitable solution is considered (2) the only practical method of eradicating most mange diseases caused by various mites. Dipping has proved the most effective method of controlling both sucking and biting lice on cattle, horses, sheep, and goats. In addition to their established worth against ticks, mites, and lice, there is evidence that certain dipping fluids are useful to combat other dangerous and costly pests like blowfly maggots on sheep, cattle grubs, and horn flies. With proper cooperation among stockmen and the use of correct dipping measures it is often possible in some districts to eliminate completely certain animal parasites.

Essentially, dipping consists of immersing animals in a medicated liquid that will kill the insects. Dipping facilities are usually so arranged that the animals enter one end of a vat filled with dip, through which they swim, and leave the vat at the opposite end. Men with dipping forks should be stationed along the vat to submerge the heads of the animals to secure complete wetting and to render assistance where necessary. To be successful, it is necessary to give close attention to details and see that the work is done carefully and thoroughly. Where dipping vats are used for the control of ticks, lice, or other external parasites of cattle, a considerable percentage of horn flies on the cattle can be destroyed by installing splashboards along the sides of the dipping vats.(3)

The dipping fluid must be of such a nature that it will kill the parasites without injury to the animal host. Depending upon the active components, dips kill the parasites by acting on them in one or more ways: as stomach poisons, as respiratory poisons, by absorption through the cuticle, or by suffocation.(4) While some dips, like certain preparations containing derris or DDT, are effective after a single treatment, most of the standard, time-tested solutions require two or more applications.

It is a simple matter, for example, to kill adult ticks by dipping, but the pupae, which are more resistant to dips, may complete their development and produce a new crop of ticks. To complete the eradication it is therefore necessary to kill the newly hatched ticks. This may be done by a second dip after a suitable interval (e. g. 24 to 28 days for sheep ticks) or by the use of a dip that will remain active long enough to destroy the young ticks after they emerge from the shell.(5)

Many Dippings Needed

SIMILARLY, one treatment is seldom sufficient to control mange and scab mites in domestic animals and in some types of mange a succession of dips at proper intervals is necessary. Thus, two dippings are usually sufficient to control psoroptic or chorioptic scab, but four or more may be needed for the more resistant sarcoptic mange. The intervals between dips should be from 10 to 14 days in the first two types of mange, but from 6 to 10 days in the last. (2)

Since many eggs survive, dips cannot be relied upon to rid animals of all lice at one treatment. However, a second dipping after an interval of two weeks will ensure freedom from lice; the young insects being killed before they reach maturity and become capable of egg-laying.

It is evident, therefore, that a knowledge of the life-history of the insect or other pest being controlled is essential to the successful use of dipping fluids. It is also well to note that individual standard dips are usually effective against various pests.

A livestock-man may purchase the requisite chemicals and make the dips himself, or he may obtain commercially prepared concentrates that are to be diluted prior to use. Quite a number of materials, used singly or in combination, serve as the active ingredients of dipping fluids. Among these are arsenicals, nicotine, coal-tar creosote, cresol, various sulfur preparations (e. g. lime-sulfur, wettable sulfur, etc.), rotenone-containing materials like derris and cubé, kerosene emulsions, crude oil, and more recently, DDT and other organic chemicals.

From this list it is obvious that many of these substances are very toxic and must be handled with suitable precautions. It should also be pointed out that there are certain regulations with regard to some of these dipping materials. For example the only dips now permitted in official dipping for scabies of sheep and cattle are made from lime-sulfur or nicotine. Under existing regulations of the Department of Agriculture, no dip can be used in official dipping for scabies unless the strength of the bath can be determined satisfactorily in the field by a practical, portable testing outfit. The liquid should be used at 95° to 105° F. and must at all times be maintained at a strength of not less than 2 per cent of "sulfide sulfur," if it is a lime-sulfur dip and not less than 0.05 per cent of nicotine if it is a nicotine dip.(5)

Nicotine Important

NICOTINE is an important ingredient of dipping fluids. If properly used, nicotine dips are efficient against mange and scab mites of horses and goats, as well as of sheep and cattle. Such fluids are also effective against sheep ticks and against lice on cattle and sheep. With such solutions, two or more dips are required, this depending on the pest being eradicated. Although nicotine concentrations of 0.07 per cent are recommended (6, 7) for dipping sheep, if used much stronger than 0.05 per cent, such solutions are liable to injure cattle.(8) Field tests for determining nicotine concentration of the dipping bath are available.

Standard nicotine dips are made with sufficient extract of tobacco or nicotine solution to give a mixture containing not less than 0.05 per cent of nicotine. For example, one pound of a 40 per cent solution of nicotine furnishes sufficient nicotine for 96 gallons of dip. When an extract is used it is necessary to calculate the amount of nicotine required on the basis the proportion of nicotine in the extract.(1) Sulfur is sometimes added to nicotine dips in the proportion of 16 pounds of flowers of sulfur to 100 gallons of diluted dip. Very little sulfur is dissolved in the dip, but a part of it remains in suspension in the bath during dipping and, remaining on the skin of the animal for a long time, helps to prevent reinfestation.(8)

One preparation of this sort, listed by Bennett, (9) is made from:

Tobacco Waste	35 *lbs.*
Water	21 *gals.*
Sulfur	10 *lbs.*

The tobacco is steeped in the water for four days, after which the sulfur is added to the strained liquor. The resulting mixture is said to be sufficient for making 100 gallons of dip, but of course such a product must be checked for its nicotine content.

In discussing the use of waste tobacco in dips, Dekker (10) has suggested that the nicotine can be supplied by submerging bags of to-

bacco in the dip for several days with daily movement of the bags to facilitate extraction.

Nicotine sulfate is also used in dips, the compound being diluted to the requisite concentration with water. Field tests (11) with fixed nicotine preparations showed that the nicotine content of the bath remains constant during the dipping of large range flocks. However, it was found that two pounds of fixed nicotine (14 per cent nicotine, 86 per cent inert ingredients) to 100 gallons of water, with or without wettable sulfur, did not eradicate sheep ticks in one dipping.

Arsenicals, nicotine, coal-tar creosote, sulfur, rotenone, DDT and other organic chemicals used in dipping combinations

Arsenicals Widely Used

ARSENICALS are extensively used in dipping fluids. Dipping in an arsenical solution, at two-week intervals, is the most satisfactory way of destroying cattle ticks. (1, 12) and a like treatment is employed for ticks on horses and mules.(5) Arsenical dips also give highly satisfactory results against sheep ticks and lice.(13) Such solutions are likewise very effective against lice on cattle, horses and goats. Simple and rapid methods of determining arsenic in dips are available.(14)

Illustrative of arsenical dips is the following U.S.D.A. formula (8) for making 500 gallons of dip on dilution with water:

Caustic soda (85% *pure*)	4 *lbs.*
White arsenic, fine powder (99% *pure*)	8 *lbs.*
Sal soda crystals	8 *lbs.*
Pine tar	1 *gal.*

Place the caustic soda in a clean iron vessel, add one gallon of water and stir until dissolved. Add the arsenic, a pound or so at a time, as fast as it can be dissolved without causing the solution to boil, stirring constantly. As soon as solution is complete, dilute to about four gallons, add the sal soda, and stir till dissolved. On cooling, make up to five gallons. The pine tar is emulsified by dissolving three-quarters of a pound of dry caustic soda or concentrated lye in one quart of water; add the pine tar, and stir until the mixture brightens to a uniform thick fluid. On testing a small portion, it should mix perfectly with water. This arsenical stock solution and emulsified tar are sufficient to make 500 gallons of dip.

A slight modification of this formula, described as a "most satisfactory dip" for sheep, is given in a Canadian source.(2) To be diluted with 500 gallons of water, the components are:

Sal soda crystals	24 *lbs.*
White arsenic (*arsenic trioxide*)	8 *lbs.*
Pine tar	1 *gal.*

Methods for making such dips are given in other sources.(15) Dry preparations, to be diluted with water before use, are also available. Illustrative is a so-called arsenic and sulfur dip, as described in a British text.(16)

Arsenic trioxide	12 *ozs.*
Dried sodium carbonate	12 *ozs.*
Sulfur	4 *ozs.*

One packet containing this quantity of materials is sufficient to make 30 gallons of dip.

Of interest in connection with this type of mixed dip, is a foreign patent (17) describing a sheep dip. Here it is claimed that dissolving arsenic trioxide in concentrated alkali and then heating with sulfur for several hours serves to decrease the toxicity of the arsenic. Other arsenical dipping fluids, containing colloidally dispersed sulfur, have been patented.(18)

Other methods for improving arsenical dips have been investigated. For example, it has been observed (19) that arsenic trioxide acts more slowly than sodium arsenite, probably because of its lower solution rate. Stewart (20) has noted that a mixed sheep dip containing arsenic trioxide (0.17 per cent), phenol and wool fat prevents infestation of sheep ticks. In line with this observation is MacLeod's (21) finding that the addition of wool grease prolongs the period of effectiveness of sodium arsenite dips for sheep ticks. Work done by Turner (22) indicates that the spontaneous oxidation of arsenical cattle dipping fluids may be controlled by the use of loetose and provides several improvements over casein.

There is considerable evidence that arsenical dipping fluids are useful for protecting sheep against blow fly maggots or screw-worms.(16, 23, 24) In Australia, jetting and dipping is extensively practiced as a preventive measure against blowfly "strike." Dipping with a solution containing two pounds of arsenic and two pounds of sodium carbonate per 100 gallons of water is effective.(2) Field experiments on the control of sheep maggots showed that regular dipping with commercial arsenic-

sulfur dips gave good control except in unfavorable weather. It was also found that arsenic dip is improved by the addition of mercurous chloride.(25)

In Scotland, other types of dips to control sheep maggot flies have been investigated. As a result, there was developed a water-miscible fluid containing cresylic acid and paradichlorbenzene, plus mineral oil, wool grease, and other components.(26)

Coal-tar creosote is another standard, widely-used basic ingredient of dipping fluids, the resulting solutions being effective if used in soft water and at proper strengths. Two dippings, at appropriate intervals, are required to eradicate ticks on sheep and lice on cattle, horses, sheep, and goats. Because coal-tar creosote dips do not mix well with hard or alkaline water, they should be tested by mixing some of the dip in the proper proportion in water in a clear glass vessel. If an oily layer or mass of globules collects either at the top or bottom of the mixture after standing one hour, the dip is not suitable for use with the kind of water tested. Improperly prepared dips of this kind are not only likely to be ineffective, but also to be toxic to animals even when mixed in the specified proportions.(1) It is essential that undiluted coal-tar creosote dips be completely homogeneous before any part is used.

Such dips are made from coal-tar derivatives and the principal ingredient is creosote oil, which is made soluble in or miscible with water by means of soap. When diluted ready for use, these dips should contain not less than 1 per cent by weight of coal-tar oils and cresylic acid. In no case should the diluted dip contain more than 0.4 per cent nor less than 0.1 per cent of cresylic acid.(8).

The following formula (27) illustrates the formulation of a dip of this class:

Creosote oil	7½ *gals.*
Crude carbolic acid	1½ *gals.*
Rosin	20 *lbs.*
Caustic soda, granulated	3 *lbs.*
Water	1¾ gals.

Dissolve the caustic soda in the water with heat; when dissolved and at the boiling point, add the rosin in small pieces, about four pounds at a time; continue to cook until the rosin is saponified. Use a large vessel to allow for frothing, and keep froth whipped down. Mix the creosote oil and carbolic acid and stir the hot rosin soap into the mixture, continuing gentle heating with constant mixing until a perfect mixture forms. For use, dilute one gallon of this dip with 70 gallons of water.

Cresol dips are frequently used for eradicating sheep ticks and are also useful for combating lice on these animals; two dips being used.(7) Available under various trade names, cresol dips generally consist of a mixture of cresylic acid with soap. When diluted ready for use, a cresol dip should contain 0.5 per cent of cresylic acid.(6) According to patent specifications, (28) various metallic cresylates may be used with sulfur to form sheep dips.

Use of Sulfur

AS is already evident, sulfur is a most useful component of dipping fluids. One important representative group, the lime-sulfur dips, find important use in the treatment of scab or mange of cattle, horses, sheep, goats and hogs. As was previously indicated, such dips must be tested in the field for the sulfide-sulfur or polysulfide-sulfur content. A number of methods for this test, including at least one patented procedure, are available.(29, 30)

Proprietary brands of lime-sulfur are available either as concentrated liquids, known as liquid lime-sulfur, or as powders or crystals, called dry lime-sulfur. The dip may also be prepared from the raw materials by the stock-man. Thus, a home-made mixture may be made along the following lines:(1, 2)

Flowers of sulfur	24 *lbs.*
Fresh unslaked lime	10 *lbs.*
Water	100 *gals.*

Slake the lime and make into a paste with water and add the sulfur, with thorough mixing. Add the paste to 30 gallons of boiling water, and boil for two hours, stirring frequently. Allow to stand and settle for several hours, preferably overnight. Siphon off the clear liquid without disturbing the sediment. To the liquid add sufficient water to make up to 100 gallons. Now ready for the dipping vat, the solution should be used at a temperature of 100° to 105° F.

A modification of this process, yielding a concentrated liquid lime-sulfur, is as follows:(9)

Sulfur	18 *lbs.*
Quicklime	9 *lbs.*
Water	21 *gals.*

Make the sulfur and lime into a thick paste with water. Place the paste in a strong cloth and suspend in a boiler containing 10 gallons of water, so that the contents are completely covered. After boiling for 2 hours, discard the solids, bring the liquid to 10 gallons with water and store in tightly closed drums. The quantity so prepared is sufficient to make 100 gallons of dip.

In field tests reported by Graham,(31) sheep dipped in 1 per cent lime-sulfur, containing 0.03 per cent of a wetting agent, remained free of mites for eight months. The polysulfide-sulfur content of the dip remained within effective limits during dipping.

Another sulfur product, fused bentonite-sulfur, is being used as a dip for sheep ticks. In making this product, melted sulfur is adsorbed onto bentonite clay, and the mass is reduced to the granular form in which it is marketed. When added to water, there results a milk-white liquid, with some of the sulfur content in colloidal form. This is mixed in the proportion of 30 pounds of the product to 100 gallons of water, to yield a mixture containing the requisite 1 per cent of sulfur. A test kit to determine the sulfur strength of the dip is available. Because of its several advantageous properties, fused bentonite-sulfur has been found to be more effective in one dipping than other fluids in common use for sheep ticks.(6) Rotenone-fortified preparations, known as fused bentonite-sulfur-cube, are used for eradicating sheep ticks in one dipping.

Arsenic-sulfur-rotenone is similarly effective.(5)

Wettable sulfur, prepared by mixing finely ground sulfur with a wetting agent, is also finding increasing use in dipping fluids. Used alone, in the ratio of 10 pounds per 100 gallons of water, wettable sulfur has proved effective in eradicating goat lice(32) and sheep ticks. (33) Wettable sulfur may also be used with other effective agents, like nicotine. Another preparation which eradicates old and young ticks, but not the pupae, in one dipping, and also kills the biting sheep louse, is prepared from(33)

Cube or derris powder (5% rotenone)	10 *lbs.*
Wettable sulfur	100 *lbs.*
Water	1000 *gals.*

Rotenone-containing materials, like cubé and derris, have found an important place in dipping fluids.(19, 34) For example, a home-made derris or cubé dip, prepared by adding 1 pound of the powdered material to each 100 gallons of water, forms an effective single-dip bath for eradicating sheep ticks. Fresh dips must be used, however, because the solutions are ineffective after a few days.(5)

MacLeod (21) has found that a dip containing both arsenic and derris protects sheep against infestation for two to three weeks. The derris kills the ticks before they can attack during the first seven to ten days, while the arsenic kills the female ticks before they can attack during the latter part of the protective period.

Most interesting is the report (35) that a rotenone dip containing a wetting agent is effective for destroying cattle grubs, which usually must be combatted by more arduous methods. From work done at the Bureau of Entomology a suitable dip contains:

Ground cubé or derris ..	10 *lbs.*
Sodium lauryl sulfate ..	2 *ozs.*
Water	100 *gals.*

As might well be expected, DDT has begun to assume an important role in various types of dipping fluids. The tests made by Rude and Parish (36, 37) have shown that ticks on sheep and goats can be controlled by a single dipping in a solution containing 0.2 per cent of DDT. No ticks were found on the animals after such treatment, nor were there any undesirable effects on either the animals or the fleeces. A stock solution, designated as No. 1235, was made by dissolving 1 part of technical DDT in 5 parts (by weight) of soluble pine oil containing an emulsifier. The solution actually used for dipping was made by adding 10 pints of the stock solution to 100 gallons of soft water and stirring well.

Other work (38) indicates that emulsions containing about 0.75 per cent of DDT, applied as a dip, may prove efficacious in eradicating hog lice following a single dipping. The preparations were in no way injurious to the swine. The nits were not killed by the dip, but young lice which hatched died following contact with the hair and skin of treated animals. Investigations (39) have also indicated that emulsion containing DDT may have potentialities as dips to combat sheep blowfly. Of pertinent interest in this connection is the announcement (40) of the commercial availability of a 50 per cent DDT powder for use in making livestock dips for the control of flies and similar pests.

Before concluding, mention should be made of the use of crude petroleum in dipping fluids. Used chiefly for controlling mange in swine and for killing hog lice and their eggs,(5) crude petroleum dips are also valuable for the treatment of sarcoptic mange of cattle. (1) Mixtures of petroleum derivatives, as well as various types of emulsions have also been used as animal dips for various parasitic infestations. (16, 41, 42)

Work on improved materials for making dipping fluids continues in Government and industrial laboratories. The possibilities of these newer organic compounds are reported in the technical literature (12, 43) or are described in patent specifications. (44, 45) All such work points to better dipping fluids and healthier livestock.★★

Bibliography

(1) Atkinson, V. T. et al.: "Diseases of Cattle," Washington, U.S. D.A., 1942, pp. 437-8, 462-6.

(2) Hearle, E.: "Insects and Allied Parasites Injurious to Livestock and Poultry in Canada," Publ. 604, Ottawa, Canad. Dept. Agri., 1938.

(3) Bruce, W. G.: "Horn Fly and Its Control," Leaflet No. 205, Washington, U.S.D.A., 1940.

(4) Anon.: Australasian Pharm. Notes and News 22:144, 1943.

(5) Symposium: "Keeping Livestock Healthy," Yearbook of Agriculture 1942, Washington, U.S.D.A.

(6) Imes, M.: "Sheep Tick and Its Eradication by Dipping," Farmers' Bull. No. 798, Washington, U.S.D.A., 1940.

(7) Hall, M. C. and Wright, W. H.: "Parasites and Parasitic Diseases of Sheep," Farmers' Bull. No. 1330, Washington, U.S.D.A., 1940.

(8) Imes, M.: "Cattle Lice and How to Eradicate Them," Farmers' Bull. No. 909:, Washington, U.S.D.A., 1940.

(9) Bennett, H.: "Chemical Formulary," Vol. VI, New York, Chem. Publ. Co., 1943, p. 111.

(10) Dekker, P. M.: Farming S. Africa 20:25, 1945.

(11) Cobbett, N. G. and Smith, C. E.: North Am. Veterinarian 25:536, 1944.

(12) Mail, G. A.: Sci. Agr. 23:59, 1942.

(13) Anon.: Australasian Pharm. Notes & News, July 17, 1942, p. 195.

(14) Soliven, F. A.: Philippine J. Animal Ind. 7:545, 1940.

(15) Lewis, E. A.: E. African Agr. J. 8:171, 1942.

(16) Forrester, G. P.: "Pharmaceutical Formulas," Vol. II, Ed. 10, London. Chem. & Drug., 1934, pp. 770-4.

(17) Nagahata, S.: Jap. Pat. 129,-349, 1939, (through) Chem. Abstr. 35:1926, 1941.

(18) Brodersen, K. and Ext. W.: U. S. Pat. 1,789,668, 1931.

(19) Burtt, E. T.: Ann. Applied Biol. 32:247, 1945.

(20) Stewart, W. L.: J. Roy. Agr. Soc. England, 97:81, 1936.

(21) MacLeod, J.: Ann. Applied Biol. 28:296, 1941.

(22) Turner, W. A.: J. Council Sci. and Ind. Research 16:107, 1943.

(23) Davies, W. M. and Hobson, R. P.: J. Ministry Agr. 44:222, 1937.

(24) Hobson, R. P.: Ann. Applied Biol. 24:408, 1937; 27:527, 1940.

(25) Angus, W. R.: Thomas, I. and Williams, O. G.: Ann. Applied Biol. 30:164, 1943.

(26) Moore, W.: Scottish J. Agr. 20:3, 1937; Chem. & Drug. 127:428, 1937.

(27) Belanger, E. J.: "Drug & Specialty Formulas," New York, Chem. Publ. Co., 1941, p. 248.

(28) Cooper, McDougal & Robertson, Ltd., Willmore, E. S. R. & Cooper,

(*Turn to Page* 55)

INSECTICIDE DEALER...

The editor interviews
HUGH BENJAMIN
Mgr., Long Island Produce & Fertilizer Co.
Mattituck, Long Island

He can and should be more than just a blender and distributor . . . as illustrated by the example of the progressive Long Island Produce and Fertilizer Company

RESPONSIBILITY of the local dealer in insecticides and other agricultural chemicals goes much further into the picture than merely blending and selling these materials to the commercial growers in his territory, according to manager Hugh Benjamin of the Mattituck, Long Island, branch of the Long Island Produce & Fertilizer Co. Mr. Benjamin supervises the mixing, blending, packing and distribution of all insecticide materials for the company as a part of his duties. The main plant and office are located at Riverhead, L. I. It is at this latter plant that the firm's operations in fertilizers, farm equipment, and other services for the farmer are directed by George Cushman, general manager of the company.

Visiting Mr. Benjamin at the Mattituck plant where all insecticide operations are conducted, we shot questions at him for an hour. He knew all the answers, both about insecticides and about the problems of the commercial growers on Long Island. He emphasized the fact that he has always undertaken to service the grower completely in the handling of insect problems. This has meant going out into the field personally and studying the problem before shipping the insecticide, to make certain that the material ordered is what is really needed, or where nothing has yet been ordered to recommend and supply the right material.

In this work of servicing the growers on the eastern half of Long Island, other dealers as well as Mr. Benjamin's company have been assisted by G. G. Gyrisko from the New York State Agricultural Experiment Station at Ithaca, N. Y. Mr. Gyrisko, an entomologist, is resident representative of the State for Suffolk County which comprises the eastern half of Long Island. He is quite proud of the fact that he is one of Dr. Charley Palm's "boys" from Cornell. Mr. Benjamin was unstinting in his praise of the cooperation and assistance which his company as well as the growers had received from Cornell in solving insect and other problems.

Discussing specifically the agricultural situation on Long Island this year, Mr. Benjamin stated that the efficacy of DDT insecticides has accounted for the embarrassingly large crop of potatoes. That the Long Island growers found themselves "up to their necks" in potatoes and did not know what to do with them, was their payoff for using DDT this year. On top of favorable growing conditions which would have meant a good potato production year anyway, the use of DDT dusts and sprays was considered responsible for approximately fifty per cent of the increased yield.

Based on figures for potato production taken at random from numerous reports which Mr. Benjamin had on his desk, the average increased yield of DDT treated areas over the check areas was about twenty-five per cent. The first report showed 447 bushels per acre where a 6% DDT dust was used, against 358 bushels for the check plot. Several others where 25% DDT liquid sprays were used showed

Above: One of the Long Island Produce and Fertilizer Company plants near Mattituck. Lower photo shows part of the company's mixing and blending machinery.

all the way from 80 to 127 bushels per acre more for the average 100 acre plot as against untreated areas.

As has been common in potato growing generally in most parts of the country, DDT this year just about completely displaced rotenone, pyrethrum, nicotine and the arsenicals. DDT also cut the cost of insect control on potatoes, according to Mr. Benjamin, to one-third of its former figure. This has meant that dealer income from insecticide sales in potato areas has been sharply reduced. Nevertheless, progressive dealers, based on the recommendations from the N. Y. State Department of Agriculture,—which in turn based its recommendations on the experimental success with DDT last year,—undertook to offer and sell DDT dusts and sprays almost exclusively this year. In view of the shortage of rotenone, nicotine, and arsenicals, however, this did not present too difficult a decision.

Cauliflower which is another important market crop in the territory serviced by Long Island Produce has been treated successfully this year with one to two per cent DDT dusts and sprays. These applications were made prior to the cauliflower heading up and are considered perfectly safe. For insect control at later stages, rotenone and pyrethrum materials were used. On lima beans, another commercial crop of importance on eastern Long Island, rotenone and sulfur continue to be the standard controls. At the moment, Mr. Benjamin pointed out, the dealers in that locality have a deep interest in finding a product to replace sulfur for red spider on lima beans. Against the melon aphid on cucumbers, nicotine vapor fumes continue to be used successfully.

Problems which have been faced by the dealers, mixers and distributors on Long Island, as reported by Mr. Benjamin, are essentially those which have faced local dealers everywhere. Shortages of basic materials have represented the main problem. In most instances, demands of dealers on the producers of basic chemicals, rotenone, nicotine and pyrethrum products, have been greater than the supply. The demand from growers for finished insecticides has likewise been heavier than the ability of the dealer to mix and deliver. But with a close knowledge by the local dealer of the individual grower's problems, supplies were allocated in accordance with needs. No damage was reported because of the inability of growers to obtain needed materials on time.

A few additional sidelights of interest were brought out by Mr. Benjamin. Eastern Long Island, always heavily infested with mosquitoes, noted a sharp drop in its mosquito population this year in the period following the widespread use of DDT dusts and sprays over large crop areas. A reduction in the local house and stable fly populations was also reported. This was attributed to DDT dust drift and to small amounts of spray washing into thousands of small stagnant pools. It has caused some concern among farmers and commercial growers for fear that beneficial insects may also be wiped out along with the un-

(*Turn to Page* 62)

The Fertilizer Industry As A Consumer Of Chemicals

By Maurice H. Lockwood*

President, National Fertilizer Association
Washington, D. C.

THROUGH the fertilizer industry, agriculture in the United States purchases more than thirteen million tons of chemicals. For the year ending June 30, 1947, prospects are that a fourteen million ton total will be so delivered as one of the important contributions toward an abundant food supply. Barring interruptions of supply, this will be ninety-one per cent more ton volume and one hundred and three per cent more of the three major plant nutrients than was used on an average during the five years 1935 through 1939.

Dollars spent nationally each year for fertilizers reflect closely farm income during the preceding year. Neither ton volume nor the quantity of plant nutrients follows the dollar sign however. The 1921 and 1937 records show that in each of those years the dollars spent by agriculture in the United States for fertilizers were approximately 253 million, yet in 1937 those dollars purchased more than twice the quantity of plant food as in 1921. This shift was due to the change from higher to lower cost materials. One change was in nitrogen sources, away from natural organics to lower unit priced inorganic chemicals. Another was the increase in plant food content of fertilizer.

These trends are continuing. The transition from a wartime government controlled economy to one based upon the risks and rewards of free enterprise, called for the best industry thinking to accelerate sound trends on the firmer foundation of competition. Many of us recognized the necessity of allocations and other restrictive procedures during the war emergency.

While the North Central States and the West Coast areas have made the more spectacular gains in fertilizer use recently, most other sections of our country have also increased their use. Now construction of facilities to produce more fertilizer materials and others with which to process and distribute them are largely aimed at the Mid-west and West Coast. But even the older, sometimes referred to as "more mature" fertilizer-using areas are re-equipping and expanding their chemical fertilizer plants to a greater extent and more rapidly than many of us may at first realize.

Wartime emergency restrictions left us nationally and regionally without the sensitive guides usually provided by a free economy for the balancing of supply and demand, but we will find the answers shortly. In fact we are already on the way to doing so with the usual spirit of prompt attack which the chemical industry has repeatedly exhibited. Low priority ratings, shortages of materials, labor and equipment prevented the slack from being taken up earlier. In the meantime, proponents of government intervention in spheres of competitive business have done much name-calling and made inaccurate statements concerning our industry—resulting in a cool appraisal of their uncourageous approach by many in the Congress and the informed public.

Back of the developments which have been and are going on to keep our industry up-to-date are those phases of (a) materials production, (b) processing technique and (c) distribution. Those of us in such fields of industrial activity have an interesting challenge for our technical ability, initiative, energy, knowledge and good judgment. Common sense will submerge those pessimists who cry for social reform crutches. They lack enough perspective to realize that if we are to progress soundly as a nation we should do so with the help of many intelligent people, and with the ability the chemical industry demonstrates in its abundant supply.

Supporting Figures

WHEN we deal in mathematics, I automatically hesitate. First because statistics are so often boring, and second because facts sometimes have a limiting effect upon our perspective. But here are a few figures against which to brace yourselves as we take a look into the speculative realm of future possibilities:

During the five year prewar period, 1935 through 1939, agriculture in the United States used an average fertilizer volume of seven and one-third million tons annually. By 1945 this had increased 81 percent to thirteen and one-fifth million tons. The

* Presented at Chemical Research Ass'n Meeting, Sept. 17, 1946, New York.

DITHANE USERS CONTROL LATE BLIGHT!

Reports from Florida to Maine all say: "Dithane stops late blight in its Tracks!"

FOR the first time in history, serious late blight has appeared in tomato fields from Florida to New England. Growers and canners who knew of DITHANE's success in controlling blight on potatoes used this fungicide to combat the disease on their tomato crops, also. Wherever used properly, the results were the same: DITHANE *stopped late blight in its tracks!*

Another point: potato growers who have used DITHANE are convinced of DITHANE's superiority in stopping both early and late blight and are reporting better-than-average yields. When DITHANE was used this year, in combination with DDT to control insects, first reports indicated that DITHANE-treated fields outyielded adjacent Bordeaux-treated fields by 68 bushels per acre. Preliminary reports from Pennsylvania showed potato yields as high as 710 bushels per acre. That's why more and more agricultural authorities are strongly convinced that DITHANE is the outstanding fungicide for blight control.

Remember. DITHANE is easy to use. It's the most effective fungicide for blight control. Increased yields far offset the additional cost, if any.

DITHANE *is a trade-mark, Reg. U.S. Pat. Off.*

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Manufacturers of Chemicals including Synthetic Insecticides . . . Fungicides . . . Plastics . . . Enzymes . . . Chemicals for the Leather, Textile and other Industries

fact that the major plant nutrients contained in that tonnage increased during that same span of years more than 86 percent is an indication of a sound trend which we can be certain will continue.

When supply and demand for fertilizers strike a balance again, there will be a shaking out of the distribution pattern not possible during the restrictions of the war years. The assimilation of war-built nitrogen fixation plants into our peacetime economy has begun. The construction and operation of phosphate mining and processing facilities is well started. It will continue with emphasis on ability to serve the recently enlarged demand in the north central and west coast areas. As Europe recovers, we are likely to renew the prewar practice of importing potash to complement the record volume now furnished by our domestic producers alone.

Nutrient elements other than nitrogen, phosphorus and potassium will come to the fore as we recognize and better understand their sound place in plant nutrition. Calcium and magnesium, boron and manganese are already in the picture in fair volume. Surphur, zinc, cobalt, copper, iron and others have their places too.

New Testing Techniques

SOIL and plant tissue testing will gain more general acceptance and use. Trained specialists will gain hard-earned recognition in the field of fertilizer usage recommendations. Back of this field, Bray, Truog, Spurway, Hester, Hoffer, Morgan and Peech are but a few of the leaders who have already contributed substantially to methods and practices along that line. Both industrial and public institution soil chemists and plant physiologists are contributing to our better understanding of plant nutrient deficiencies, their diagnosis and correction.

The field of preventive practice in this direction has only begun. Some of this may appear to be a long way from our major interests. But it is not. Even though such practices are not yet, nor may ever be an exact science, substantial progress in technique and knowledge has been made during the past ten years. Such general usage as is now evident in Illinois and North Carolina, for example, is but a symptom of approaching maturity for this branch of agricultural chemistry which bids fair to increase the efficiency as well as the quantity of fertilizers used. These factors cannot avoid affecting constructively the market for chemicals.

With transportation costs, as well as labor costs, increasing and likely to remain higher than in the past, we may well make repeated studies of means for reducing the costs on the farm of production supplies. Even though the return per dollar expended for fertilizers is already high in agricultural use, the producers of fertilizer chemicals, as well as the blending and distribution segments of industry, will cooperate in the direction of stepping up still further the concentration of plant nutrients.

Long strides have already been made in that direction. From an industry using large proportions of natural organic by-products, fertilizer manufacture has changed in less than a generation to a business of predominantly inorganic chemical nature. As long ago as 1925 only one-fourth of fertilizer nitrogen used here in the United States was from natural organics. By 1940 this proportion had decreased to one-eighth. For the year ending next June 30th there will be a further decline to less than one-twentieth. Conversely ammonia and its solutions which in 1925 had as yet assumed no measurable per cent of the fertilizer nitrogen supply picture, had claimed one-eighth of the market by 1940. They bid fair to make up one-fourth of the total this year. Solid ammonium nitrate, of which little or none was used as fertilizer in this country in 1925, has now assumed one-fifth of the market. Did someone say the fertilizer industry was slow to change?

Phosphates in the fertilizer industry have also undergone some changes and made progress, critics of the industry notwithstanding. Phosphate rock recovery processes and volume have been stepped up. Fused phosphates have recently entered the picture and will apparently amount to about one hundred thousand tons of material for the current year.

While tank-car shortages limit the completely free movement of potential sulfuric acid volume, and therefore inhibit the possible full production of ordinary analysis, superphosphate, new capacity for concentrated superphosphate production is under construction in both the southeast and northwest. The total fertilizer phosphate scheduled production promises to reach a new high of approximately one and one-half million tons of phosphoric acid, equivalent to twice the prewar five year average.

Table One

Fertilizer Nitrogen—Used in the U. S. Total—In Mixtures and as Materials, Combined

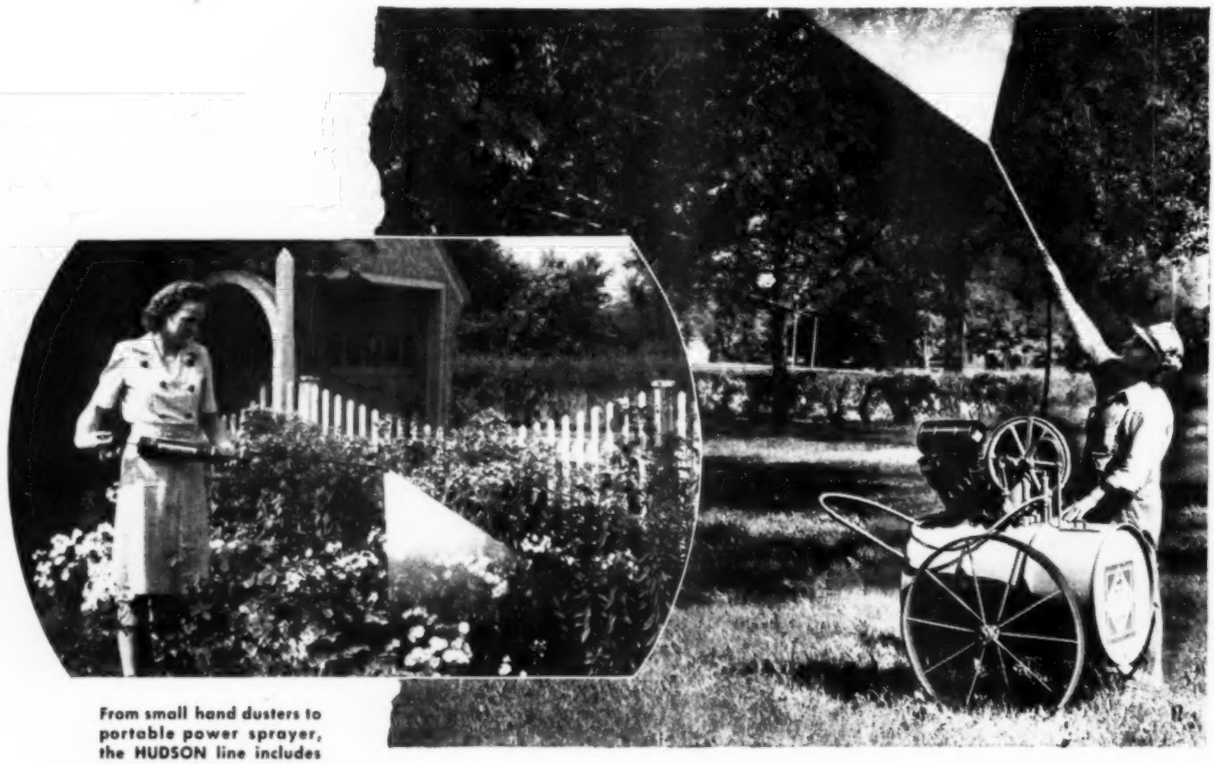
Form	1925	1940	1946-47
	%	%	%
Solid Nitrates..	39	32	18
Solid Ammonium Salts ..	31	35	46
Natural Organics	25	12	4½
Synthetic Organics ...	5	8	6½
Ammonia and its Solutions.	0	13	25
Total	100	100	100
Quantity Index	100	150	257

Table Two

Long Tons of Phosphate Rock Production and Domestic Use in the United States

Source	*1925*	*1940*	*1945*
Florida	3,281,560	3,186,413	4,238,228
Tennessee	536,731	1,113,684	1,294,297
Idaho, Montana, Utah and Wyoming..	81,347	182,926	274,198
Total Domestic Rock Production.	3,899,638	4,483,023	5,806,723
Apparent Domestic Consumption	2,928,077	3,644,656	5,458,815
Volume Index	100	124	186

THE *Right* SPRAYER or DUSTER FOR EVERY NEED



From small hand dusters to portable power sprayer, the HUDSON line includes equipment for every spraying or dusting job.

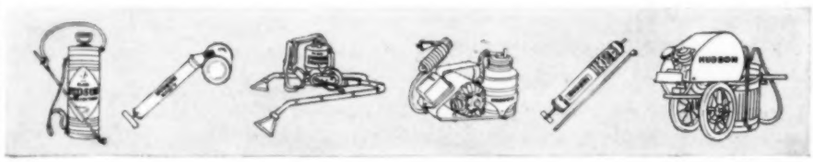
Efficient application—putting the *right amount* in the *right places*—that is the purpose for which every HUDSON sprayer or duster is designed. And to insure efficient application for all users, everywhere, HUDSON makes sprayers and dusters of every type—from small units for household use to large capacity units for commercial use. All types are built for easy operation, which encourages *more frequent* application. All types are designed for long service life, reducing the cost over the long term.

Whether your interest is the *sale* or the *use* of sprayers and dusters, depend on the HUDSON "Diamond-H" line for greatest success.

HUDSON

H. D. HUDSON MANUFACTURING COMPANY
589 East Illinois Street, Chicago 11, Illinois
Branches in all Principal Cities in U. S.

Tested and Proved
SPRAYERS AND DUSTERS



Sanitation Plus DDT on the

DAIRY FARM

By Dr. Ed M. Searls[1] and Dr. Alfred Weed[2]

THE outstanding insecticide of World War II. DDT, promises to be a valuable help in maintaining sanitation on the dairy farm if used to the best advantage. Thorough experiments have demonstrated that DDT will kill flies, mosquitoes, lice and other insects which bite and annoy the dairy farmer and his cows, spread contagion through the herd and to milk products, and disease among the farm animals. DDT insecticides will kill such pests even when used in almost unbelievably small quantities. Residual toxicity continues for almost unbelievably long periods.

Wonderful as this chemical seems to be as an insecticide, however, it cannot replace the practice of sanitation in and about the dairy barn and on the dairy herd. No insecticide so far known can hold flies in check if manure and other decaying animal or vegetable matter are allowed to accumulate about the place and furnish a breeding place for thousands of maggots. No amount of spraying or dusting with insecticides can take the place of good dairy herd management with well tended cows in clean, airy stables. Such cows seldom suffer seriously from lice. Frequent clipping of the flanks and hind quarters make it practically impossible for certain species of lice to lie upon the animals when these practices are supplemented by the careful use of DDT insecticides. DDT cannot do it all alone; but used in connection with the dairy practices, produces results in insect control.

Probably only a few dairy farmers know how much they actually lose in milk production because of louse attack in the winter, or from biting flies in the summer. In fact, it is doubtful if many farmers are fully aware of the condition when their herds are infested with lice. Lice are at their worst in the winter. Cows are their poorest in the winter and the poorest cows seem always to be the most heavily infested. Sleek, well fed, well tended cows are seldom badly infested with lice. But the average farmer, with an average herd, frequently fails to realize that his animals are partly covered with lice, nor would he care to admit it if he did know. It has been estimated that a dairyman pays from 15 to 20 per cent of his whole milk production as tribute to lice during the louse months. Good herd management with frequent flank clippings and occasional dusting with DDT is a profitable procedure in view of the prevention of such loss. Under extreme circumstances, lice have been known to kill cows. DDT powder sprayed or dusted upon the coats of the animals and rubbed or driven down to the hide will complete the work started by clipping and good herd management.

Experiments to date have shown that the wettable powder is the best to use for louse control. The other forms of DDT either do not work as well or offer certain hazards in connection with their use. The non-wettable powder cannot be used as a spray except where power agitation is available. The DDT emulsion is still considered hazardous to use on the animals because of solvents present in the diluted spray material. More testing is necessary before it may be recommended freely. In any case, the kerosene solution should not be used either in the dairy barn or on the dairy animals. Sprayed upon the walls and ceilings, it soaks in where it is largely lost. Used carelessly on the animals, it could do much more harm than good. These, the wettable powder, non-wettable powder, the emulsion concentrate and the kerosene solution, are the common forms in which DDT is available. Experience has shown that the wettable powder is the best friend of the dairyman in insect control about about the dairy barn and on the dairy animals. It can be used as a spray during the warm months for fly control. During the freezing months, it is quite effective when used as a dust for louse control.

When the wettable powder is used, the water soon soaks in or evaporates, leaving only the powder. This is the same powder that was dusted into the underwear and uniforms of our fighting men to protect them from insects and insect-carried diseases in camps and on the battlefields. It did its work well and without injury to the men. Unless it is left where thirsty animals can drink large quantities of the spray or eat large quantities of the powder, the wettable powder will be equally safe to use about and on the animals if the directions on the container are followed. The other forms of DDT, the non-wettable powder, the emulsion, and the kerosene solution may not be recommended as freely.

Fifty per cent DDT wettable

(*Turn to Page* 65)

[1] National Dairy Products Corp.
[2] John Powell & Co., Inc.

D&O
ESTABLISHED 1798

BASIC MATERIALS FOR AGRICULTURAL INSECTICIDES

ROTENONE POWDER

ROTENONE RESINS

ROTENONE LIQUID EXTRACTS

PYRETHRUM POWDER

PYRETHRUM EXTRACTS
(#20, #40, and higher)

PYRETHRUM OLEORESINS, 20%

PYRETOX #100
(Impregnated Pyrethrum Dust Base, 1% Pyrethrins)

***PYRENONE DUST BASES**
(Piperonyl Cyclohexenone and Pyrethrins)

***PYRENONE CONCENTRATES,** (liquid)

Current important developments in the application of Pyrenone Concentrates and Dust Bases to insect control problems will be covered in a continuing series of bulletins. If your name is not on our mailing list please assist us in repairing the omission.

**Reg. Trade Mark*

Dodge & Olcott, Inc.

INSECTICIDE DIVISION

60 EAST 42nd STREET • NEW YORK 17, N. Y.

General Offices: 180 Varick St., New York 14, N. Y.

BOSTON • CHICAGO • PHILADELPHIA • ST. LOUIS • LOS ANGELES

Plant and Laboratories . . . Bayonne, N. J.

CANADIAN AGENTS: STANDARD CHEMICAL CO., LTD., 195 FLEET STREET E., TORONTO, ONT.

Experiment Station Digest

By H. H. Slawson

INVESTIGATIONS conducted by the economic entomology section of the Illinois Natural History Survey and the state agricultural experiment station have led to the prediction that benzene hexachloride (666) and Velsicol "1068," will find wide use in the control of many insect pests. These two materials were among a number of old and new chemical compounds subjected to screening tests during the Illinois station's fiscal year ending April 30, 1946. Laboratory tests were conducted against several species of insects and in some cases small field plot tests were also made.

Both products seem to have some merits and may find a place in our modern insect control work," reports Dr. George C. Decker, of the Station and Survey staff. If a proposed fellowship to be set up by the Velsicol Corp. materializes, "666" and "1068" will become the subject of intensive study.

DDT was extensively investigated at the Illinois station, an effort being made in all cases to obtain all data possible on the effects of this material on plants, other insect pests, valuable parasites and predators and miscellaneous insects encountered in the plots. Regarding the attempt to obtain information on the effects of DDT upon men and animals the report states: "To date we have no information whatever to indicate that DDT, when used in accord with instructions or advice supplied by a competent entomologist, has or will seriously affect the health of man or animals."

Since use of DDT on fruits, vegetables and other crops is frequently accompanied by an increase in mites and red spiders, the Illinois work included tests of a large series of compounds in the hope of discovering and developing a suitable control for these pests. Results of this project have not yet been released.

During the year work on insecticides for control of corn borer in Illinois was transferred from market and garden sweet corn to canning corn and hybrid seed corn. Data obtained from one series of tests, says the report, "would indicate that 1 percent rotenone, 3 percent DDT and 3 percent "Ryania" dust were about equally effective in controlling the corn borer. In all cases the number of borers per stalk and the number of ears infected were reduced about 80 to 90 percent." Increased yields also followed, varying from 11 to as high as 36 bushels per acre, with an average increase of 22.7 bushels.

When the corn was graded, and ears unsuited for use as seed stock were discarded, the difference in favor of the treatments was even more pronounced, the increased yield varying from 18 to 47 bushels per acre and averaging 32.3 bushels. Airplane spraying and dusting of canning corn for control of second brood corn borer increased gross yield of corn harvested by 18 percent or about one-half a ton per acre, and as a result of decreased trimming losses the net yield of cut corn ready for canning was increased about 30 percent.

The use of insecticides against corn borer is still "definitely experimental," the Illinois report warns, but adds that in view of the favorable results obtained "it would apparently be impossible and perhaps unwise to restrain growers from using insecticides pending verification of our data by additional research."

Chinch bug control work at Illinois included experiments with chemically treated paper fence barriers, resulting in the conclusion that if a chemically treated paper barrier could be developed which would not require re-treatment during the entire migration period, such a protective device "is within the realm of possibility." From rather conclusive field tests, it was also concluded that it is possible to protect and save corn heavily infested with chinch bugs by application of a 20 percent sabadilla dust.

DDT is endorsed as a dust for control of potato insects, it being, says the report "so effective in controlling the Colorado potato beetle, the potato flea beetle and the potato leafhopper that this material can hardly be compared with older insecticides."

Illinois orchardists were reported less insistent on use of DDT for codling moth control, but in tests on 18 plots DDT, in all of several different formulations proved superior to lear arsenate or nicotine. Other findings from his project were: (1) under some conditions, DDT used in combination with summer oils produced moderate to serious plant injury; (2) some varieties of apples are more susceptible to DDT-oil injury than others; (3) leafhoppers are controlled completely by DDT sprays; (4) use of DDT is usually followed by an increase in mite and red spider population, this increase, in general, being proportionate to the amount of DDT used.

In a study of onion thrips and other onion insects, a 5 percent DDT dust applied at the rate of 2 lbs. of actual DDT per acre, per application, gave the best control of thrips, but a DDT wettable powder applied as a spray at the rate of 1.2 lbs. of DDT per acre per application, and a DDT liquid concentrate at 0.35 lbs. of DDT per acre, "apparently gave no better control of onion thrips than the standard tartar emetic-brown sugar sprays."

DDT applied against cucumber beetles killed or drove away all beetles present at time of application and thereafter no serious infestation developed. But one DDT spray caused very noticeable stunting of young plants and, while DDT dusts containing up to 3 percent of the insecticide did not seem to reduce vine growth, the total yields decreased as the DDT concentrate increased. However, the report notes, a 0.75 percent rotenone which is also recommended for use on cucumbers, also caused some reduction in yield.

DDT again proved highly effective in controlling all species of cabbage worms in the Illinois test

plots. A 2 percent dust gave control, but to obtain maximum control at least a 3 percent dust was suggested. Very satisfactory control of squash vine borers was obtained by DDT dusts on Chicago variety Hubbard squash, but all DDT sprays caused noticeable stunting, says the report.

Greenhouse leaftier, a serious greenhouse pest which until now has been rather difficult to control, was completely controlled where one-fourth pound of DDT was applied to chrysanthemums at intervals during growth of the crop. In greenhouse benches infested with symphillids, production was greatly increased by treating the soil with "Dowfume G." For the florist, also, the Illinois report states that control of red spiders on carnations by sodium selenate treatments is "extremely promising." Exact treatment requirements have not yet been determined, however.

Gladiolus corms treated with a 1 percent or more DDT dust were completely protected from gladiolus thrip injury and the report declares that "DDT dust will undoubtedly replace naphthalene flakes and other materials previously recommended for bulb treatment."

Aphid Control

BETTER aphid insecticides are coming, Wisconsin farmers are assured by the Wisconsin Experiment Station in its 1945 annual report. DDT dusts in concentrations of 3 to 5 percent were in every case more effective than four insecticides commonly recommended for pea aphids in Wisconsin. Better than DDT, however, were combinations of this insecticide with rotenone, oil and an oil-like solvent. The report of this project thus concludes that while DDT is a good pea aphid insecticide, better ones probably can be devised from combination of DDT, various solvents and other insecticides. Further studies along this line were promised.

Airplane dusting of peas, as practiced in the past, has a serious drawback, declares the Wisconsin report, in that it is apt to result in a needlessly heavy application along the center of the strip and a too-light one at the edges. In one instance, five days after a plane had applied 40 lbs. of DDT dust per acre in strips about 40 ft. wide, the edges of the strips had twice as many live aphids as the middle. Part of a check strip had been dusted on the same day with a ground machine for comparison and, while the middle of the plane-dusted strips had a better aphid control than was secured with the ground-duster, the average favored ground dusting by a good margin. For efficient control of pea aphids a reasonably uniform coverage is required and to correct the trouble, it is suggested that it may be necessary to overlap the plane-dusted strips, so as to cover only 25 to 30 feet at a time.

Preliminary Wisconsin tests indicated that the new British insecticide, benzene hexachloride or "666," appears to be very effective for certain insects. "Spectacular" kills were obtained of many insects, including some which DDT affects very little or not at all. This material kills in three ways, by contact, as a stomach poison or as a fumigant, and the report characterizes as a most remarkable finding the fact that pea aphids could be killed by the fumes from benzene hexachloride after the dust had as long as eight days in which to settle.

Impressive results showed up when this new compound was applied against the waxy cabbage aphid, which is immune to most insecticides, including DDT. Repeated tests with 5 percent benzene hexachloride dust on heavily infested plants in each case brought about a quick, complete kill. Similar results were obtained with the compound against the cherry aphid, another insect difficult to control. Successful work with the material on cabbage worms, cucumber beetles, potato beetles and thrips is also recounted. But benzene hexachloride failed to control leafhoppers infesting potatoes and beans, and control of flies and mosquitoes was also unsatisfactory.

The Wisconsin report points out that benzene hexachloride has a strong, musty odor which can limit its usefulness. When beans, cauliflower and broccoli were cooked three to four days after being dusted with "666" they carried such an unpleasant flavor that they could not be eaten. Cabbage, whose outer leaves had been removed, was, however an exception here. So far, concludes the Wisconsin report, the findings with benzene hexachloride, as with DDT, serve to emphasize that there is no "universal insecticide." "New, as well as old, insecticides," says the report, "must be selected and used with due regards for their advantages and limitations and their possible dangers."

The Wisconsin investigators determined that proper application of DDT under favorable conditions can keep barns relatively free from common flies for at least three months. Effects of the insecticide wore off faster in recently whitewashed barns, posing the problem of altering formulas of either the insecticide or the whitewash or both, a project for future research.

Among other findings of the Wisconsin entomological research during 1945 were the following: Particle size is the key factor in rotenone dispersants; DDT offers promise as a good control for the disease known as "carrot yellows"; a sabadilla-sulfur combination killed spittle bugs in hayfields, but failed to control reinfestation; DDT gave excellent control of insects infesting squash, melons and cucumbers, but caused injury to the plants; DDT is far head of other insecticides for potatoes, but using Bordeaux mixture in potato sprays containing DDT may retard the killing power of the insecticide; DDT is superior to lead arsenate for codling moth control and appears to be the best insecticide now available against this pest; new copper compounds now on the market are recommended for control of seedbed diseases of tobacco plants, including damping off or "bed rot," wildfire and black fire.

Copper Hydroarsenate

AT the Ames, Iowa experiment station no new toxicological experiments were conducted during the year, but a paper was prepared presenting information on the insecticidal effectiveness of two new preparations containing copper hydroarsenate, in comparison with five other compounds. Results were reported to indicate that the copper hydroarsenate and mixtures of it have considerable promise as stomach poisons for cer-

(*Turn to Page* 57)

Comments....

By Dr. Alvin J. Cox

This column by Dr. Cox will appear from time to time as a feature of AGRICULTURAL CHEMICALS. Dr. Cox formerly was successively Physical Chemist, Chief Chemist, Assistant Director, and Director of the Bureau of Science, Government of the Philippines. He was appointed Chief of the Bureau of Chemistry, California State Dept. of Agriculture in 1932 and retired in 1945.

THE condition of the economic poisons trade before the passage of the Insecticide Act of 1910 was wholly unsatisfactory. The sentiment of those appearing before the Committee on Interstate and Foreign Commerce of the House of Representatives in March, 1910, when the bill was being considered was unanimous that such an act was necessary to remedy the confused conditions existing in the trade. There was no standard for insecticides and no statement on the label from which the user could calculate the amount and strength to be used.

The entomologist would carry on experiments and find that a certain dosage of an insecticide would control an insect without injury to vegetation. He would publish these results, but he could not be sure that another batch of the same insecticide would afford the same effective control.

About the same situation existed with respect to fertilizers. As stated by a member of the New Hampshire Agricultural Experiment Station, "It is as if a physician were writing a prescription and he had no pharmacopoeia which insured the standardization of the drugs." The Federal and State governments were spending large amounts of money on experimental work but were not getting the results they had a right to expect. In some cases the materials were so weak that they were valueless as insecticides. In others, the products were not properly made and injury to foliage resulted. When a user would buy an insecticide and it was not effective, he would be likely to condemn all economic poisons and the entomologists who recommend them. The result was that the trade of even good manufacturers was injured.

There is no doubt that a large proportion of the insecticides manufactured at that time were unsatisfactory. Nearly half of the Paris greens tested by Federal chemists contained too much sodium sulfate, and one sixth were high in water soluble arsenic—so high that they would probably cause injury to vegetation. The water in lead arsenates varied from one to sixty-one per cent; one fifth were high in water soluble arsenic; and 28% did not come within the limits of composition required by the Insecticide Act. Samples sold as potassium cyanide contained as little as 28% of that ingredient, and some of them consisted of sodium cyanide and sodium chloride. One fifth of the samples of insect powder contained lead chromate which would probably cause injury to human health when used as a dust.

The variable composition of insecticides, particularly the high percentage of water soluble arsenic which often occurred, resulted in very serious damage to orchard trees. One orchardist testified that due to defective lead arsenate his own orchard was damaged to the extent of $3,000 or $4,000 and that in addition, other owners in the neighborhood who owned approximately 6,000,000 peach trees or one third of the total in Georgia, also observed the damage and as a result, the use of lead arsenate on peach trees was delayed for 8 or 9 years. Another case was cited of an orchard of 50,000 peach trees being destroyed because of bad spray material.

Manufacturers requested the passage of the bill because they desired uniform insecticide laws in the various states and believed that a federal act would serve as a model on which the State laws would be based. They also complained that they were confronted by unfair competition from firms who were putting out low-priced inferior products, and it was impossible to meet this competition without lowering the quality of their own products.

Products improved under the Insecticide Act of 1910 but the Act was much too limited in its scope. State lawmakers did pattern somewhat after the Federal law, but at the insistence of manufacturers and users alike many State laws were broadened to include all economic poisons.

My office in California handled the case of a manufacturer of a product the label of which showed neither a statement of composition nor directions for use. The shortcoming was brought to my attention by a purchaser trying to figure out for what purpose the product was to be used and at what dosage. Among others, another questionable product was offered for registration as an economic poison in California. When I asked against what pest the material was effective I received the reply "We don't know, we just want to sell it." The law covers all such cases, but enforcement officers have to be alert. Reputable manufacturers have gone a long

(Turn to Page 60)

It's New! Powco Brand Antu — alpha naphthyl thiourea — a new, economical, effective rodenticide which is extremely acceptable to rats.

It's Deadly! Kills rats in 12 to 48 hours. A Specific for Brown Rat but kills other species, too. Every batch biologically and chemically controlled for effectiveness.

It's Antu! Use it in standard bait formulas in as little as 1 to 3% concentrations. Use it as a contact poison—package it in dust guns or shaker top cans with talc or pyrophyllite.

It's Antu! The rat killer the world has been waiting for. It's ready for delivery in 5, 10, 25 and 100 lb. containers. Write, wire or phone for a generous sample and descriptive literature, today.

Send Today!

JOHN POWELL & CO., INC.
One Park Avenue, New York 16, N. Y.

☐ Please send sample of Powco Brand Antu.
☐ Please send descriptive literature.

Name..... Position.....

Company .....

Address .....

City..... State.....

JOHN POWELL & CO., INC.

BASIC MATERIALS FOR
INSECTICIDE MANUFACTURERS

ONE PARK AVE, NEW YORK 16, N.Y.

The Listening Post

This department, which reviews current plant disease and insect control problems, is a monthly feature of AGRICULTURAL CHEMICALS. The following comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Survey. The following summary of their most recent reports was prepared especially for this magazine.

By Paul R. Miller

IN Virginia under the direction of the Extension Pathologist approximately 85 demonstrations in the use of "Fermate" for the control of tobacco blue mold (*Peronospora tabacina*) were set up at the beginning of the season. A total of over 50 reports were received from cooperators on the results of these demonstrations.

Practically all of the demonstrators reported satisfaction with the treatment. Most of them stated that "Fermate" was more effective than any material they had ever used and that they intend to treat their plant beds with it again next year. Several stated that they had abundant plants for their own use and for their neighbors. They considered the treatment to be very practical and simple to use. About 90 per cent of the demonstrators thought that "Fermate" stimulated plant growth in addition to controlling the disease. Some stated that the treated plants grew faster and that they were greener and stockier than untreated ones; also, that the "Fermate" treatment seemed to help the plants even after they were set in the field.

Even though there were frequent rains which greatly interfered with the spray applications, satisfactory results were reported. There was some mold in most of the treated beds; however, it caused little damage. Many unsprayed beds were a complete loss in practically all other cases, transplanting was delayed about 2 weeks and only about 65 per cent as many plants were obtained even then.

As a result of the 1946 blue mold control program, it is estimated that over 50 per cent of the tobacco growers in the flue-cured area and approximately 25 per cent of the growers in the dark and burley areas sprayed their plant beds with "Fermate" during the season. As a result, there were ample plants in all three belts to set out the tobacco acreage with a large surplus left over.

Mosaic in Southern Calif.*

Mosaic, caused by the cantaloup mosaic virus, was perhaps more prevalent this year in cantaloups and Honey Dew melons than in any other year in the history of melon production in the Imperial Valley of California. The virus causes a conspicuous mosaic pattern in the leaves, with only slight rolling and disfiguration, and usually reduces the size of the leaf without material alteration of its perimeter; petioles and stems may be slightly mottled. Immature fruits are conspicuously mottled, with more or less circular, raised, dark green areas upon a light green background; fruits are frequently distorted into odd shapes. The net on ripening infected cantaloup fruits fails to develop properly in aerial extent and depth, and as a consequence the sutures appear broad and shallow; this results in the production of a large number of

(*Turn to Page* 54)

* This summary is based upon the cooperative work of Dr. John T. Middleton, University of California and Dr. Thomas W. Whitaker, Bureau of Plant Industry.

Insect Conditions in October

By G. J. Haeussler

This column is prepared especially for readers of AGRICULTURAL CHEMICALS. Mr. Haeussler is in charge of Insect Pest Survey and Information, Agricultural Research Administration, Bureau of Entomology and Plant Quarantine, U.S.D.A. His observations, based on latest reports received by the Bureau from collaborators all over the country, will be a monthly feature of AGRICULTURAL CHEMICALS.

THE activity of many insect pests began to taper off after the middle of September and as a result correspondingly fewer observations have been reported since that time.

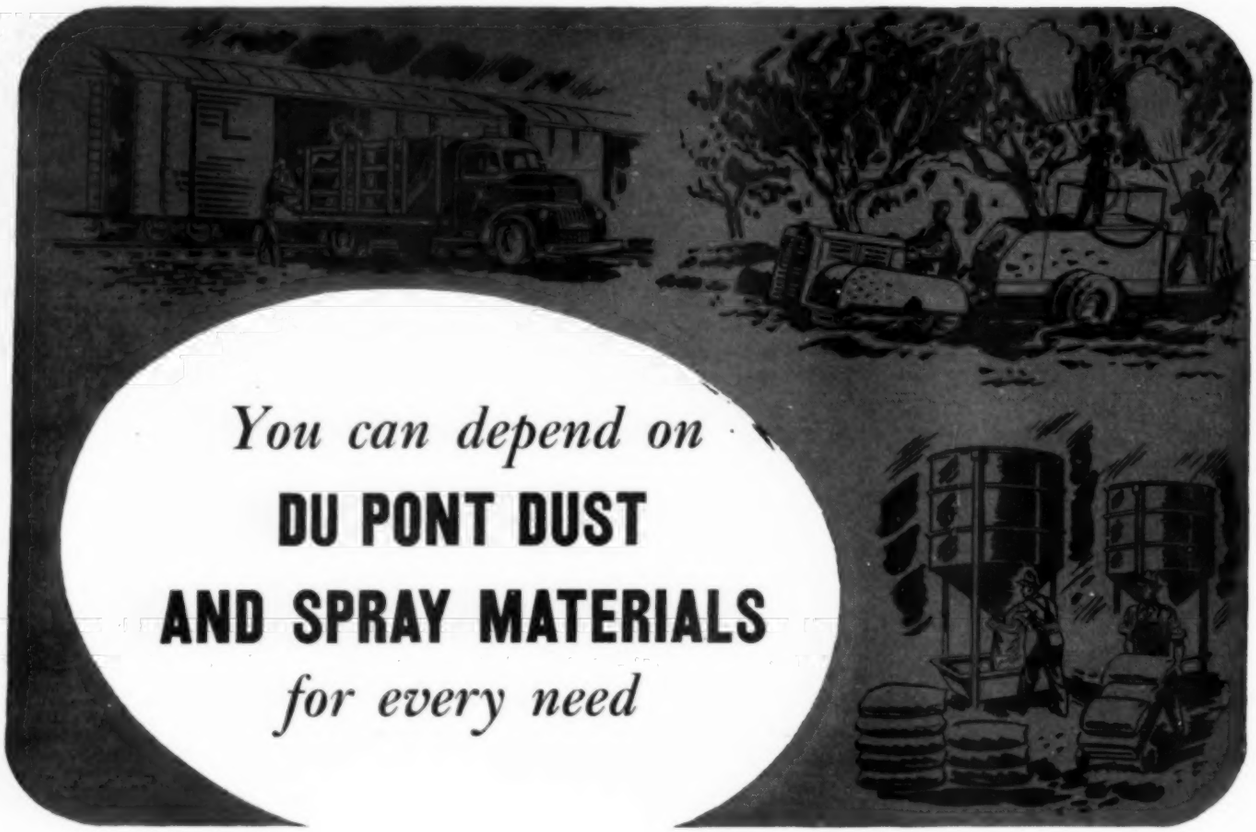
Cabbage caterpillars continued to cause moderate to heavy damage to cabbage and related crops in Virginia and Georgia into early October. They were reported injuring cole crops to a lesser degree in Maryland, northwestern Tennessee, South Carolina, Florida, Alabama, and southern California. An outstanding feature of the cabbage caterpillar infestation during the last half of September was the prevalence of the cross-striped cabbage worm in the upper portions of South Carolina, southwestern North Carolina, and northwestern Tennessee. According to one reporter, this insect seems to be chiefly a pest of summer and fall-grown crucifiers in the higher elevations of that area.

The harlequin bug has continued as a major pest of cole crops in parts of Virginia, South Carolina, and Tennessee, and to a lesser extent in Georgia.

Reports from eastern Virginia indicated that some commercial kale fields there were plowed under shortly after mid-September because of cutworm damage, while in some fields where baiting was carried on good control resulted.

The tomato fruitworm has been reported light to numerous during this period in tomato fields of southern California. Complaints of injury by this insect to late tomato were reported the first week of October from northeastern Georgia, and light infestations still persisted on tomato in South Carolina.

The tobacco hornworm caused considerable defoliation and some fruit damage in Orange and Santa



You can depend on

DU PONT DUST AND SPRAY MATERIALS

for every need

TESTED PEST CONTROL PRODUCTS

DEENATE* "50-W" DDT Insecticide. The all-round DDT for most spray jobs. 50% DDT quick-mixing wettable powder. Du Pont DEENATE DDT is also available in four other easy-to-use forms.

FERMATE* Fungicide. New organic fungicide. 70% active ingredients. Controls tobacco blue mold, apple scab and rust, brown rot and leaf spot of cherries, anthracnose on beans and tomatoes, and blights of celery and tomatoes. Spray or dust.

ZERLATE* Fungicide. Another new organic fungicide for spray or dust use. Readily compatible. Particularly good for improving potato yields and for controlling brown rot of peaches. Effective against many diseases of tomatoes, beans and celery.

COPPER-A Compound. An excellent fixed copper fungicide for spraying or dusting potatoes, tomatoes and celery to control blights. Has high copper content—yet low solubility makes it safe. Controls leaf spot of cherries. Use also for apples.

SPECIAL DUST MIXTURES

For manufacturers and large scale users of insecticides, Du Pont's products and facilities are available for making an almost endless variety of special dust mixtures for pest control. Our technical service men are available to consult with you on your problems. For full details, write E. I. du Pont de Nemours & Co. (Inc.), Grasselli Chemicals Dept., Wilmington 98, Delaware.

DEENATE* DDT
GRASSELLI* Lead Arsenate
NUREXFORM* Lead Arsenate
ALORCO** Cryolite
BLACK LEAF "40" & "155"†
Basic Lead Arsenate
Calcium Arsenate
Paris Green
LORO* Contact Insecticide
ZERLATE* } New Organic
FERNATE* } Fungicides
COPPER-A Compound
SULFORON* } Wettable
SULFORON-X* } Sulfurs
Copper Sulfate (monohydrated)
Copper Sulfate (spray types)
Bordeaux Mixture
Lime Sulfur
Flotation Sulfur Paste
Zinc Sulfate (Flake)
KRENITE* Dinitro Spray
Dormant Spray Oils
Summer Spray Oils
PARMONE* Pre-Harvest Fruit Drop Inhibitor
Du Pont Spreader Sticker
2, 4-D WEED KILLER
AMMATE* Weed Killer
Special Dust Mixtures

*Reg. Trade Mark of E. I. du Pont de Nemours & Co. (Inc.)
**Reg. Trade Mark of Aluminum Ore Company
†Reg. Trade Mark of Tobacco By-Products & Chemical Corp., Inc.

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING...*THROUGH CHEMISTRY*

DU PONT PEST CONTROL PRODUCTS

For the Harvest of Better Crops

Barbara Counties, California, during late September.

Early in October the beet armyworm was causing damage to early planted fields of fall peas in Orange County, California, and the pepper weevil was numerous in some pepper fields in Ventura County.

Although populations of the Mexican bean beetle have continued to decline, this insect was still causing serious damage to beans in early October in parts of Virginia, South Carolina, Florida, and northwestern Tennessee, and some damage, though of lesser extent, in parts of Georgia and Alabama.

The corn earworm was reported the first week of October still causing serious losses to beans in Virginia and moderate losses in South Carolina. It was reported at that same time as the insect causing most damage to cabbage and related crops in South Carolina and still doing some damage to beans in Georgia and Florida.

The southern green stinkbug has continued to cause some damage to pole lima beans in eastern Virginia, has continued active on late beans and cowpeas in South Carolina, and was still causing slight injury to beans in Georgia in early October. It also has continued to cause injury to cole crops in the South.

Serious infestations of the green stinkbug on beans were reported early in October in the Nashville district of North Carolina.

The celery leaf tier and tortrix larvae caused considerable damage to early plantings of celery in the Salt River Valley of southern Arizona about the third week of September and attempts at control with pyrethrum dusts, rotenone dusts, and a pyrethrum-DDT combination dust were not entirely satisfactory.

Cabbage aphids have continued to constitute a serious problem into October on cole crops in Virginia, northwestern Tennessee, and California, with lighter populations occurring in South Carolina. The first week of October aphids were still numerous on celery and peppers in some parts of Florida. The potato aphid was still present at that time in moderate abundance on potato and very abundant on tomatos in northwestern Tennessee. Light infestations of the pea aphid were also reported persisting on fall-crop market peas in the Norfolk, Va. district. During the last half of September melon aphid populations increased to moderate numbers on cucurbits in South Carolina and Florida and a heavy infestation developed on cantaloup in Los Angeles County, California.★★

New Books . . .

"INVENTIONS AT YOUR SERVICE," by Albert J. Kramer, 139 pages, 1946, Sauls Planograph Company, 1731 14th Street, N.W., Washington, D. C. $5.

This book represents an excellent example of what industry can receive from the research work of the Federal Government—in fact it represents a form of return on the tax money which is put into scientific research. Abstracts of all the important public service patents obtained by the USDA during the past 16 years are given, except those being obtained during the current year. The patents cover inventions which are available to all free of any royalties, fees or other charges.

The author, patent adviser for the USDA, points out that there are many agencies within the Federal Government which have organized research laboratories for developing inventions and that these laboratories are operated with public funds appropriated by Congress. He emphasizes that the inventions developed in these laboratories belong to the public.

These public service patents are obtained on inventions from the various agencies to insure the unrestricted use of the inventions by the public. There are two types of public service patents.

First: those which are dedicated to the free use of the public in the territory of the United States. Anyone may freely use the inventions covered by such a patent without asking the Department's permission.

Second: those which are assigned under the control of the Secretary of Agriculture. In order to use the inventions covered by an assigned patent a license must first be obtained from the Secretary. Such licenses are currently issued without cost, nor other charge for royalty nor fee. The author points out that these licenses may contain special provisions in the interest of public health and safety. The license must be non-exclusive, nonassignable and revokable in accordance with a ruling by the Attorney General. In each abstract the type of public service patent is clearly indicated.

The author did not include all the patents issued to the Department during the period indicated. In the opinion of the reviewer, he wisely chose those patents under which licenses have been issued by the Department, and patents relating to the same or similar subject matter. However, practically all of the more recently issued patents have been included.

The subjects covered include the fields of insect, fungus and weed control; fertilizers and soil treatments; agricultural and road equipment, and others. All patents issued to the Department of Agriculture on the various insecticides, fungicides and herbicides during the period mentioned are covered in the volume.

Apart from the important specific information given, Mr. Kramer's book has a secondary value for those desiring to formulate a concept of what constitutes a patentable invention. Such a concept is difficult to acquire without knowing about a large number of inventions that have been patented previously. There are a sufficient number of patents abstracted in the volume to give the reader a fair idea of the order of inventive ingenuity required for patenting.

Melvin Goldberg

Discuss Fertilizers at A.C.S. Meeting

THE amount of fluorine introduced into the soil by fluoride-carrying phosphates used infertilizers has no harmful effect on plant growth or on animals or humans who consume the plants, according to a report presented at the American Chemical Society's 110th national meeting in Chicago in September. Among other topics of interest to the agricultural chemical industry, presented at the meeting were such matters as spontaneous combustion in mixed fertilizers; inland lakes as important reservoirs of fertilizer materials; the mechanism of insecticidal action; and use of plant growth regulators. Over 9,000 chemists, chemical engineers and industrialists attended the 5-day sessions of the organization. Some 750 reports were read dealing with new developments in pure and applied chemical science.

Fluorine is essential to the nutrition of plants and animals, it was determined in experiments conducted at the Tennessee Agricultural Experiment Station by four investigators, W. H. MacIntire, S. H. Winterberg, L. B. Clements and H. W. Dunham. There is only a small occurrence of this element in soils, their paper asserted, and this is replenished only by the meagre increment brought by rain water and through phosphatic fertilizers and insecticides.

Discussing "Spontaneous Development of Heat in Mixed Fertilizers," John O. Hardesty and R. O. E. Davis, of the U. S. Dept. of Agriculture, explaining that spontaneous ignition may result under certain storage conditions.

A Standard Carrier for Insecticidal and Fungicidal Dust

EMT CO.
23

TALC

This grade of talc has proper and efficient bulking characteristics.

SOFT flaky particles which enhance stickiness.

COMPATIBILITY with all insecticides.

SOFTNESS which eliminates abrasion in dusting machine nozzles.

FINENESS — The proper fineness for complete coverage, determined by Entomologists.

UNIFORMITY of all qualities guaranteed by the largest manufacturer of the greatest variety of talcs in the world.

Working samples furnished free

•

Eastern Magnesia Talc Co., Inc.

Burlington Waterbury Johnson

VERMONT

CHEMICAL SEED TREATMENT

(*Continued from Page* 25)

slurry so that each unit of corn receives its correct amount of slurry. There is no calibrating to be done, and if the slurry or suspension is properly made by adding the correct amount of chemical to the correct amount of water, there is no possibility of the seed receiving either more or less than the recommended dosage of disinfectant.

Whether these advantages of the slurry method in the treatment of seed corn can be extended to the treatment of the small grains, cottonseed, and other seeds remains to be determined. Exploratory investigations in that direction have produced encouraging results. It is not too much to hope even now that in the near future the principle of the slurry method for treating seed corn can be adapted to the treatment of many other sorts of seed. If we can devise for the seed processors of cotton, grain, peas, and other seeds a slurry method modified to meet the requirements of these sorts of seeds, we shall have made their seed-treating operation less hazardous, less disagreeable, and much more accurate.★★

Technical Briefs

DDT for Cattle Flies

Experimental spraying and dipping of beef cattle with DDT indicated quick inactivation of deposits on cattle from low-concentration sprays, and suggested at least 1 per cent of DDT in suspensions and 2.5 per cent in emulsions for long-lasting effectiveness against hornflies (*Siphona irritans*). Although dipping is more effective than spraying at equal DDT concentrations, dipping requires more material and is of doubtful practical value.

An effective spraying apparatus consists of a chute with many spray nozzles so arranged that the entire animal is covered with spray as it runs through the chute. DDT sprays apparently reduced mosquitoes in some cases, but tabanid fly populations were not reduced. DDT in adhesive sprays and greases markedly reduced screwworm cases predisposed by Gulf Coast tick infestations. J. G. Matthysse. *J. Econ. Entomol. 39*, 62-5 (1946)

•

Test Spore Viability

Tests to determine the effect of the sun's rays on the viability of *Bacillus Popilliae* Dutky, the organism causing milky disease of Japanese beetle larvae, are reported by Ralph T. White of the U.S.O.A. Bureau of Entomology and Plant Quarantine. Spore mixtures were dusted thinly over shallow trays and exposed out of doors to full sunlight for various periods of time from 1 to 80 hours. Similar tests were made of spore-dust samples not exposed to sunlight, to determine the viability of spores in the original material; and parallel experiments were made in which equal samples of the original spore dust were placed in an oven at 140° F. for the same periods as those exposed in the sunlight.

Results indicate that there is no reduction in viability when milky disease spores are exposed to the sun for 8 hours or less, that there is a significant reduction in viability when they are exposed from 16 to 40 hours, and that there is a further marked reduction in viability when they are exposed for 48 hours or more.

The infection rate in the series exposed to 140° F. for as much as 80 hours was similar to that obtained from impregnated spore dust not exposed to the sun. This indicates that the effect of heat alone on the potency of *Bacillus popilliae* is of minor importance under field conditions. As applied to actual use, the tests mean that sunlight does not materially reduce viability of the spores when the latter are used in accordance with the spot method followed by the U.S.D.A. and co-operating agencies.

Most of the dust is deposited on the turf or soil in layers sufficiently thick to prevent damage to any except the thin top layer of spores. On the other hand, a considerable reduction in the viability of spores may result when the dust mixture is broadcast in a very thin film, if several sunny days pass before the material can be washed in by rains or otherwise worked into the soil or turf.

•

Winter Horse Tick Control

The winter horse tick, *Dermacentor nigrolineatus*, which causes poisoning of horses and injury to cattle, is controlled on horses by sponging or spraying with a preparation containing 0.8 per cent of DDT made from 1 part by weight of DDT dissolved in 5 parts of a soluble pine oil. The preparation is diluted to 6 fluid ounces per gallon of water before application. The solution should not come in contact with the hands. H. E. Parish and C. S. Rude. *J. Econ. Entomol. 39*, 92-3 (1946)

•

Pear Psylla Outbreak

A sudden outbreak of pear psylla in many orchards and nursery blocks late this season gave orchardists in New York State reason for worry. The pests had been so scarce since 1940 that entomologists at the Geneva (N.Y.) Experiment Station had experienced difficulty in finding enough specimens to conduct control experiments. This condition was true even through the spring of 1946, it is reported, but in July and August the insects began to multiply rapidly, so that by September, many pear trees were dripping with honey dew and the black, disfiguring sooty fungus had developed on both fruit and trees. Control methods by spring and summer spray treatments are scheduled for next season in order to avoid a repetition of this year's experience, according to the Experiment Station report.

•

Plane Spray Saves Crop

Airplane dusting of DDT on a 20-acre field of clover in Illinois was practically 100 per cent effective against the clover leaf weevil and about 75 per cent effective against cut worms which were devouring the foliage. The cost of the job, done early this summer, was, according to the farm manager, $2.50 per acre, but the crop was saved.

•

Borax Apple Treatment

Because of the great physiological effects of boron upon apple development, Mark H. Haller, pomologist, and L. P. Batjer, senior pomologist, Division of Fruit and Vegetable Crops and Diseases, U.S.D.A. report a study of the influence of boron on the response of apples in storage. The complete paper appears in the *Journal of Agricultural Research* of Sept. 15.

In summarizing their experiments, the authors state that their studies from 1940 to 1944 were conducted on several varieties of apples in various localities to determine the effects of treatment of the soil with borax upon the boron content of the fruit and its relation to storage quality. With one exception there was sufficient boron in the soils to prevent the development of internal cork in the fruit.

The boron content of the fruit was greatly increased by the borax applications, frequently to more than 40 p. p. m., a quantity greatly in excess of that necessary to control internal cork. The boron content of the fruit decreased gradually from year to year

DIRECTORS

W. C. BENNETT
President, Phelps Dodge Refining Corp.

J. HALLAM BOYD
Exec. Vice-President, Commercial Chemical Co.

JOSEPH B. CARY
President, Niagara Sprayer & Chemical Division; *Vice-President*, Food Machinery Corp.

HAROLD C. DAVIES
President, California Spray-Chemical Corp.

WALTER S. GAVAN
Manager, Insecticide Division, American Cyanamid Co.

LEA S. HITCHNER
Executive Secretary, AIF Association

GEORGE F. LEONARD
Vice-President, Tobacco By-Products & Chemical Corp.

HOWARD P. MANSFIELD
Assistant to General Manager, E. I. duPont de Nemours & Co., Inc.

JAMES McCONNON
Vice-President, McConnon and Company

E. H. PHILLIPS
In Charge of Purchasing, Co-operative G.L.F. Soil-Building Service

FRED SHANEMAN
Vice-President, Pennsylvania Salt Manufacturing Co.

BYRON P. WEBSTER
Vice-President, Chipman Chemical Company, Inc.

H. DEWITT WHITTLESEY
Sr. Vice-President., Sherwin-Williams Co.

F. W. WIEDER
Western Division Manager, San Francisco Sulphur Co.

Legislation . . .

TODAY there are more than 300 Federal and State laws, regulations and interpretations affecting agricultural insecticides, fungicides and other chemicals.

One of this Association's services to its industry is a continuing report on all of these as they develop.

Agricultural Insecticide & Fungicide Association

285 Madison Ave. **New York 17, N. Y.**

OFFICERS

GEORGE F. LEONARD, *President*
HAROLD C. DAVIES, *Vice-President*
LEA S. HITCHNER, *Executive Secretary and Treasurer*

after the initial borax application when no further borax was applied but was maintained considerably above that in the untreated fruit for 3 and 4 years.

The borax applications had no appreciable effect on the soluble solids and acidity of the fruit and no consistent effect on their firmness. Sometimes they caused earlier dropping of the fruit. Under some circumstances they hastened the ground-color changes from green to yellow and the development of red. Dropping and color changes are associated with advanced maturity. As changes in dessert quality were not hastened by the treatments, earlier picking could not be practiced without sacrificing dessert quality.

The relation of boron content and decay was not consistent. Applications of borax influenced the development of certain physiological disorders during storage. An internal break-down in Jonathan apples was greatly increased by the treatments; a similar break-down in Rome Beauty was increased during one season. On the other hand, storage scald of Grimes Golden, Delicious, Rome Beauty, and York Imperial was appreciably reduced by the treatments.

The results indicate that where borax applications to the soil resulted in a boron content of the fruit in excess of that necessary to control internal cork they have considerably influenced the physiology of the fruit and may be beneficial or detrimental to the storage quality of the fruit, depending on variety, concentration, and probably other factors.

•

'Arasan' Seed Disinfectant

Use of "Arasan" seed disinfectant as a control of bean weevil, rice weevil, confused flour beetle, cadelle beetle and Mediterranean flour beetle is reported to be successful in tests made late the past summer. The product, manufactured by E. I. du Pont de Nemours & Co., Wilmington, is claimed to give protection against many seed-borne and soil borne fungus diseases as well as controlling numerous insects on stored seed.

In laboratory tests, "Arasan" was used to treat seeds of beans, lima beans, wheat, rye and corn to which from 10 to 25 insects were added in each lot. Examinations and counts of living and dead insects at intervals disclosed that but few insects lived more than a few days in the treated seed, while in a control lot of untreated seeds the insects thrived by devouring the edible portions of seeds. It is pointed out that "Arasan" not only kills insects present in stored seed, but repels others.

•

New Potato Record

Record potato yields are reported in the state of Pennsylvania this year, despite severe blight conditions which threatened for a time to reduce production.

Use of the synthetic fungicide, "Dithane"* is credited with contributing to the blight control program, according to the report, in a manner similar to the way in which the fungus was halted in potato growing areas in Maine and Florida earlier in the season.

A former county record in potato yield was broken by Elmer S. Myers of Lancaster county with a yield of 731.9 bushels of Katahdin potatoes per acre. In the same county a new record was set for Cobbler potatoes with a yield of 630 bushels per acre. In Lehigh county records were set for Russets.

Grower Myers, in producing his record yield, reports that he applied a total of 17 sprays, 11 of which contained DDT wettable powder added to both "Dithane" and Bordeaux formulas. He indicates that the yield was heavier from portions of the field where "Dithane" had been used.

•

Nematode Fumigation

Soil fumigation work is nearing completion on some 1,200 acres of Nassau County, Long Island, potato land which was placed under quarantine this year to gain control of a serious infestation of golden nematode. Results thus far in the program indicate control of more than 90 per cent following a nearly three month application of "D-D" soil fumigant (dichloropropane and dichloropropylene) at the rate of from 450 to 1,200 pounds per acre. The project is expected to be continued until complete control of the parasite is achieved, according to Dr. Gootbold Steiner, Division of Nematology, U.S.D.A.

The treatments began in July under the joint supervision of the Agricultural Research Administration of the Bureau of Entomology and Plant Quarantine, U.S.D.A.; the Division of Nematology of the Bureau of Plant Industry, Soils and Agricultural Engineering; the New York State College of Agriculture at Ithaca, and the New York State Department of Agriculture and Markets.

Owners of the quarantined land received indemnities from the state of New York amounting to approximately $65 per acre while the land is out of production. The over all state budget for the fumigation program set aside some $80,000 for this purpose.

•

Cyanamid Correction

In the August issue of *Agricultural Chemicals*, a report was published on the use of a fertilizer containing Cyanamid, stating that some damage was done to tobacco seedlings in the process.

Mr. M. V. Bailey, Director of Agricultural Research of the American Cyanamid Company, New York, writes to correct the error, stating that the report was not complete. "Being incomplete," he states, "It leaves an erroneous impression about our product. The poor results reported were investigated and it was found that the fertilizer used on these tobacco beds was material made up for other special uses in crop fertilization. It was used on tobacco beds more or less in error and contrary to the local fertilizer manufacturers' recommendations. It appears to us that these facts should have been included in the report."

"The statement that rye was damaged with the fertilizer was, we believe, in error, because we annually sell hundreds of tons of straight cyanamid for small grain top-dressing. We know it is repeatedly used for this purpose without damage to either the grain or the accompanying legume crops."

* "Dithane" is produced by Rohm & Haas Co., Philadelphia.

Manufacturers of ORGANIC CHEMICALS

2, 4-D

2,4 Dichlorophenoxyacetic Acid

and

Sodium Salt

★

DDT

Dichlorodiphenyltrichlorethane

★

KOLKER CHEMICAL WORKS

80 Lister Avenue Newark 5, N. J.

THE VANDERBILT LABORATORY

EAST NORWALK, CONN.

To Our PYRAX Customers

We have expanded our plant and are now producing more PYRAX ABB than ever before.

But we still cannot make enough to fill all of your orders in any one season.

To avoid disappointment and to insure satisfying your 1947 requirements, we urge you to schedule your needs well in advance, to order early and to take delivery of at least part of your order during the Winter season.

We will appreciate your cooperation.

R. T. VANDERBILT CO., Inc.

Specialties Dept.

230 Park Avenue . New York 17, N. Y.

STATEMENT OF OWNERSHIP

Statement of the ownership, management, circulation, etc., required by the Acts of Congress of August 24, 1912, and March 3, 1933 of Agricultural Chemicals, published monthly at New York, 1, N. Y., for October 1, 1946.

State of New York, County of New York.

Before me, a Notary Public in and for the State and County aforesaid, personally appeared Wayne E. Dorland, who, having been duly sworn according to law, deposes and says that he is the Associate Editor of Agricultural Chemicals and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, Industry Publications, Inc., 254 W. 31st St., N. Y. 1; Associate Editor, Wayne E. Dorland, 254 W. 31st St., N. Y. 1; Managing Editor, Lawrence A. Long.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

Industry Publications, Inc., 254 W. 31st St., N. Y. 1; Ira P. MacNair, 254 W. 31st St., N. Y. 1; Grant A. Dorland, Russell Cave Pike, Lexington, Ky.; Wayne E. Dorland, 254 W. 31st St., N. Y. 1.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stocks, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the months preceding the date shown above is ——. (This information is required from daily publications only.)

WAYNE E. DORLAND, Associate Editor.

Sworn to and subscribed before me this 1st day of October, 1946.

HARRIET LEVINE, Notary Public.

Bronx County Clerk's No. 56. New York County Clerk's No. 624. Commission Expires March 30, 1948.

INDUSTRY NEWS

U. S. Rubber Sales Mgr.

United States Rubber Company announces that Dr. Travis W. Brasfield has been appointed sales manager for agricultural chemicals, Naugatuck Chemical Division. Dr. Brasfield, a native of Midland, Arkansas, holds degrees from the University of Arkansas and the University of Iowa.

Before the war, he taught scientific subjects in a southern college. When called to active service in 1940, Dr. Brasfield was assigned to intelligence and counter intelligence work in the Army Air Forces. He rose to the rank of Lt. Colonel before his honorable discharge this year.

•

Phytopaths to Meet

The American Pathological Society will hold its 38th annual meeting December 27, 28, 29, and 30 at the Netherland Plaza Hotel, Cincinnati, Ohio. The four-day sessions are planned to consist of business meetings, election of officers, meetings of various sections of the society, and a dinner on Sunday evening. Active membership of the Society numbers more than 1,200. Present officers are J. H. Craigie of Central Experimental Farm, Ottawa, Canada, president; A. J. Riker, University of Wisconsin, vice-president; E. M. Johnson, Kentucky Agricultural Experiment Station, Lexington, secretary; and R. M. Caldwell of Purdue U., Lafayette, Ind., treasurer.

•

N. Y. State Conference

The eighth annual New York State Insecticide and Fungicide Conference was held at the state experiment station at Geneva, N. Y. November 13 and 14. The meeting was planned through the co-operation of the Department of Entomology and Plant Pathology at Cornell University, Ithaca, and the Division of Entomology and Plant Pathology, Geneva. In addition to the groups from Ithaca and Geneva, representatives of manufacturers of insecticides and fungicides as well as various processors and dealers doing business in New York state co-operated in planning and executing the conference. Procedure was recommended for control of insects and diseases of crops during the 1947 season.

•

New Gen. Chemical Head

Mark Biddison, formerly assistant general manager of the General Chemical Company, New York, was recently named general manager of the firm. Mr. Biddison has been with General Chemical for the past 28 years. In his new position of general manager, he succeeds Mark Bradley, recently resigned.

•

Dr. Van Stone Appointed

Dr. Nathan E. Van Stone, director of manufacturing operations for the Sherwin-Williams Company, Cleveland, was recently appointed vice-president and executive director of the special chemical products division of the firm and its affiliated companies.

Officers of New Fertilizer Association

—Photo by American Plant Food Council.

Newly-elected officers of the Association of American Fertilizer Control Officials. Seated (left to right) B. D. Cloaninger, head of the Dept. of Fertilizer Inspection and Analysis, Clemson, S. C., executive committee; D. S. Coltrane, Assistant Agricultural Commissioner for N. Carolina, Raleigh, president; H. R. Walls, Chief Chemist, Feed and Fertilizer Inspection Service, College Park, Md., secretary-treasurer. Standing (left to right) Dr. F. E. Quackenbush, State chemist, Dept. of Agricultural Chemistry, Lafayette, Ind., member of executive committee; Dr. J. F. Fudge, State chemist, College Station, Texas, executive committee; L. S. Walker, chemist in charge, Agricultural Experiment Station, Burlington, Vt., executive committee. Vice-president Allen B. Lemmon, chief of the Bureau of Chemistry, State of California, was not present when the photo was taken.

The officers were elected at the recent meeting of the group in Washington, D. C. Objects of the Association are to promote uniform legislation for Fertilizer industry.

More Lead Is Allocated

Ten million pounds of lead for the production of insecticides during the last quarter of 1946 have been allotted the industry by the Civilian Production Administration, it was announced on October 9. The action, taken through amendment to limitation order L-354, also provides for a 2,000,000 pound reserve for appeals.

The increased allotment for insecticides was designed to meet needs in various agricultural fields. Lead arsenic output in the third quarter, the seasonal low, was even less than normal this year, with a large scale diversion to production of calcium arsenate to control boll weevil attacks in the south. Because the supply of arsenate continues to be a limiting factor in the production of arsenate of lead, according to a CPA spokesman, allocation to individual insecticide manufacturers will continue to be based on applications during the fourth quarter.

DISTRIBUTORS:

HERE ARE 5 REASONS WHY YOU SHOULD HANDLE GEIGY GESAROL* AND NEOCID* DDT COMPOSITIONS

BECAUSE—

1. They have been developed by the ORIGINATORS of DDT Insecticides.
2. They are tried and proven—backed by SEVEN YEARS of research and experience.
3. They present a complete line of special formulations covering every field of DDT application. (Geigy offers 5 GESAROL compositions for sprays and dusts to control specific plant pests—6 NEOCID compositions for control of specific insects affecting man and animals.)
4. They are nationally advertised. Copy appearing in 22 national and sectional publications read by potato growers, truck farmers, horticulturists, dairymen and cattlemen all over the U.S.A.
5. Geigy provides a variety of colorful hard-hitting Dealer Helps such as Educational Booklets, Folders, Counter Displays, Streamers, etc., which carry EXTRA PUNCH because all the world knows that when it comes to DDT, facts from Geigy are facts from the source!

Good territories are still open. WRITE or WIRE now for further information and Broadside on our Sales Campaign.

* Reg. U.S. Pat. Off.

GEIGY COMPANY, INC.
89 BARCLAY STREET, NEW YORK 8, N. Y.
Originators of DDT Insecticides

Chemical Ass'n Meets

The Chemical Market Research Association met in Chicago's Palmer House on October 31 to discuss the food industry as a consumer and producer of chemicals. Speakers scheduled to appear included Dr. Albert E. Elder, director of research, Corn Products Refining Company; Dr. Victor Conquest, director of research, Armour & Company; Mr. Roger V. Wilson, manager of customer service research department of the Continental Can Company, and J. J. Harris, also of Continental Can Co. Louis Ware, president, International Mineral and Chemical Corporation spoke at the evening dinner.

•

Arborists' Conference

The 22nd annual meeting of the National Shade Tree Conference was held August 27-30 in Boston, with a registration of 570. Officers elected included Charles F. Irish, arborist of Cleveland, Ohio, president; Curtis May, pathologist, Beltsville, Md., vice-president; L. C. Chadwick, Ohio State University, Columbus, secretary; and Paul E. Tilford of Ohio Agricultural Experiment Station, Wooster, editor of *Arborist's News*.

Among the speakers were Governor M. J. Tobin of Massachusetts, Judge Edward T. Simoneau, Marlborough, Mass., Frank J. Pipal, Omaha, Nebr., Dr. Charles Abbot of Harvard University, and Dr. Curtis May of the U. S. Department of Agriculture. Dr. May spoke on "Shade Tree Disease Research," stating that the U.S.D.A. Division of Forest Pathology is carrying on investigations of the Dutch Elm Disease, Phloem Necrosis of Elms, Oak Wilt, and Mimosa Wilt.

Panel discussions were held on various topics, field demonstrations of new equipment were made, and thirty-three commercial companies exhibited equipment available to arborists in caring for shade trees. In discussions held on protecting trees from lightning, a report was made of recent surveys indicating that there is no record of properly protected trees ever being damaged by lightning. The group voted to hold its 1947 annual meeting at Cleveland, Ohio.

New Vice-Presidents of John Powell & Co.

David W. Lynch

David G. Hoyer

John Powell & Company, New York, have announced the appointment of two vice presidents. The new appointees are David G. Hoyer and David W. Lynch. The former is now vice president of the Powell Export Corporation, while Mr. Lynch will continue to service the middlewest and southwestern territories for the company as formerly. His headquarters are in Chicago.

Mr. Hoyer, who served in the U. S. Navy during the war, has been assistant to the export manager since his release from the armed forces a year ago. Before the war he was purchasing agent for the Powell company. Mr. Hoyer's headquarters will be in the firm's offices, One Park Avenue, New York.

•

Dr. Winton Dies at 82

Dr. Andrew Lincoln Winton, 82, chemist and food plant histologist, died October 17 at his home in Wilton, Conn. Dr. Winton was formerly chief of the Chicago Food and Drug Laboratory of the U. S. Department of Agriculture, and had devoted his life in research into the nutritive value of food plants. His work took him to many parts of the world. One of his last works was completion of a 1,000-page treatise, "The Analysis of Foods," rated as one of the best technical studies of the subject.

Dr. Winton began as a chemist of the Connecticut Agricultural Experiment station in 1884, later to become head of the analytical laboratory there. In 1902 he took on the additional duties of instructor of organic analysis at Yale University, and was made chief of the Chief Laboratory in 1907.

•

Named ACS Div. Chairman

Dr. Bernard L. Oser, vice president and director of Food research Laboratories, Inc., Long Island City, N.Y., has been elected chairman of the division of agricultural and food chemistry of the American Chemical Society, it was announced October 15. Dr. Oser replaces Prof. N. B. Guerrant of Pennsylvania State College.

The new chairman received B.S. and M.S. degrees from the University of Pennsylvania and a Ph.D. degree from Fordham University. In 1922 he was a biochemist at the Philadelphia General Hospital. Four years later he became assistant director of the Food Research Laboratories. He subsequently became director, and was made vice-president seven years ago.

Dr. Oser is author or co-author of numerous papers on methodology, stabilization and control of vitamins in foods, fish liver oils and pharmaceutical products. He is a member of the national council of the American Chemical Society and of the editorial advisory board of the analytical edition of *Industrial and Engineering Chemistry*, published by the society.

•

Co-ops Back Model Law

The National Council of Farmer Cooperatives, Washington, D. C., has called on its member associations, representing 4,800 local co-op units with 2,400,000 farmer patrons to lend their full support to a movement, now under way, to draft a uniform state law governing the regulation and marketing of economic poisons.

First steps toward preparation of such a model statute was started Sept. 9, when representatives of trade associations, farm organizations, state officials and federal agencies met with the Dept. of Justice in Washington. The meeting was called at the request of the Council of State Governments, following the failure of Congress to act at its last session on H. R. 5645.

Kenya Group Visits in United States

Left to right: W. F. B. McLellan, R. E. Norton, and R. H. O. Lopdell, members of a delegation from the Pyrethrum Board of Kenya, visiting the United States for discussions with American processors and importers. Mr. Norton is Commissioner for East Africa, with offices in London. Mr. McLellan is chairman of the Pyrethrum Board of Kenya, and Mr. Lopdell is Assistant Manager of the Kenya Farmers' Association.

operated with the U. S. Army and Navy Departments in the development of the life saver dye marker and shark repellent packet.

•

LISTENING POST

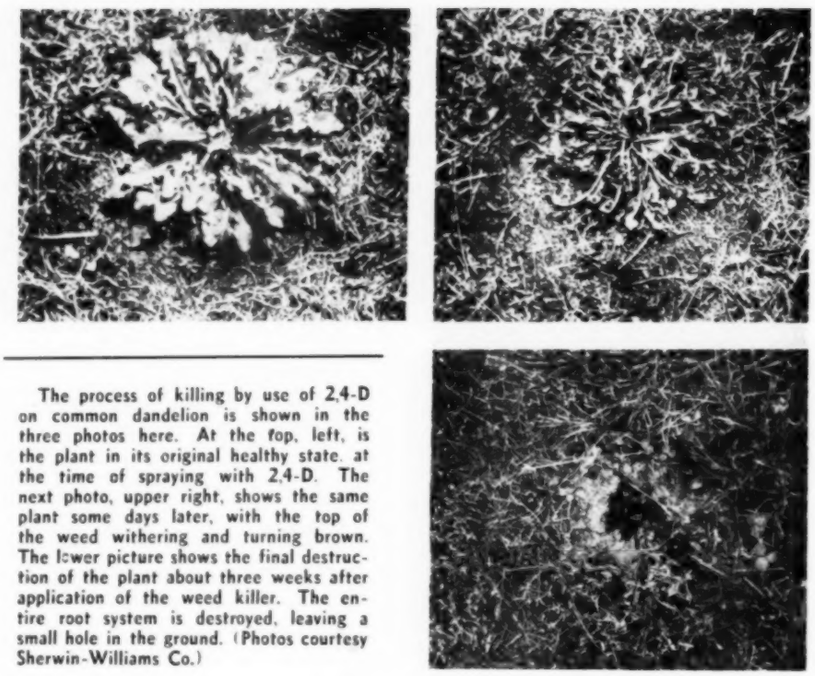
(*Continued from Page 43*)

"slickers" and sunburned fruit. Normal appearing cantaloups from mosaic-infected vines are lower in total soluble solids than normal appearing fruit from healthy vines. Mature infected Honey Dew fruits remain mottled, the pattern is one of light green, on a yellow-green background, and the fruit surface retains some of its earlier roughness.

There is a material reduction in yield of both cantaloup and Honey Dew melons as a result of virus infection. The yield is reduced through the failure of infected vines to set a normal amount of fruit as well as by the production of fruit of poor quality. Diseased cantaloups usually outyield diseased Honey Dews, cantaloups producing about a 70 per cent crop and Honey Dews about a 25 per cent crop.

Mosaic-infected young vines evidence a severe shock effect followed by a fair recovery, whereas mosaic-infected old vines show no such shock to yield even a much reduced crop, effect but fail to recover sufficiently

The presence of the virus in the seed planted, unusually large aphid populations observed early in the



The process of killing by use of 2,4-D on common dandelion is shown in the three photos here. At the top, left, is the plant in its original healthy state, at the time of spraying with 2,4-D. The next photo, upper right, shows the same plant some days later, with the top of the weed withering and turning brown. The lower picture shows the final destruction of the plant about three weeks after application of the weed killer. The entire root system is destroyed, leaving a small hole in the ground. (Photos courtesy Sherwin-Williams Co.)

EVERLASTINGLY AT IT!.....

Black Leaf

Yes, TOBACCO BY-PRODUCTS is everlastingly at it — developing products of vital importance to agriculture.

BLACK LEAF — a trademark embracing a comprehensive variety of nicotine-based products.

1. THE FAMOUS BLACK LEAF 40—Used as a spray or dust in controlling small insects and plant lice. Also used to control external parasites of cattle, sheep and poultry—and as a drench for sheep.

2. BLACK LEAF 155—for cover sprays for codling moth.

3. BLACK LEAF POWDER AND PELLETS — for controlling the large roundworm in chickens.

4. BLACK LEAF 155 WITH DDT—for control of codling moth and certain other insects.

5. BLACK LEAF 10 DUST BASE—meets the demand for a non-alkaline neutral dust.

6. BLACK LEAF CUNIC DRENCH—for sheep and goats. Formula recommended by U. S. Dept. of Agriculture.

7. BLACK LEAF DRY CONCENTRATE—used either as a spray or base mixture with carrier for dusting.

THE "TOBACCO BY-PRODUCTS" LINE ALSO INCLUDES

8. MASH-NIC — for mixing with poultry feed to control large roundworm.

9. NICO-FUME LIQUID—for greenhouse work.

10. NICO-FUME PRESSURE FUMIGATOR—spreads fumes under pressure when ignited. Saves contact of hands with powder.

PROTECTION For The Farmer • PROFITS For The Distributor

TOBACCO BY-PRODUCTS & CHEMICAL CORPORATION, INCORPORATED
LOUISVILLE, KENTUCKY

growing season, and inadequate supplies of insecticides, may well account for the severity of the disease this year.

A careful survey of a large number of commercial varieties, several hundred inbred lines, and segregating material in the breeding plot collections of the U. S. Department of Agriculture, failed to show any indication of resistance to this virus disease.★★

CATTLE DIPS

(*Continued from Page* 30)

F. A.: Brit. Pats. 542,809, 1942; 552,-434, 1943.

(29) Dekker, P. M.: Farming S. Africa 13:18 and 142, 1938.

(30) Newborne, R. G. and Les Veaux, J. F.: U. S. Pat. 2,124,307, 1938.

(31) Graham, V. P. H.: J. Council Sci. & Ind. Research 16:206, 1943.

(32) Babcock, O. G.: "Sulfur Dips for the Control of Goat Lice," Rep. E-394, Washington, U.S.D.A., 1942.

(33) Schwardt, H. H. and Matthysee, J. G.: J. Econ. Entomol. 36:105, 1943.

(34) Moore, W.: Rev. Applied Entomol. 27B:242, 1938.

(35) Anon.: "Preparation and Use of Dusts, Sprays, Washes and Dips Containing Rotenone for the Destruction of Cattle Grubs," Rep. E-623, Washington, U.S.D.A., 1944.

(36) Rude, C. S. and Parish, H. E.: "Control of the Sheep Tick by a Single Dipping in DDT Emulsion," Rep. E-679, Washington, U.S.D.A., 1946.

(37) Parish, H. E. and Rude, C. S.: J. Econ. Entomol. 38:612, 1945.

(38) Kemper, H. E. and Roberts, I. H.: J. Am. Veter. Med. Assn. 108: 252, 1946.

(39) Cragg, J. B.: Nature 155:394, 1945.

(40) Anon.: Chem. Ind. 59:151, 1946.

(41) Anon.: "Pharmaceutical Recipe Book," Ed. 3, Washington, Am. Pharm. Assn., 1943, pp. 320-1.

(42) Thomssen, E. G. and Dover, M. H.: Soap & Sanit. Chem. 19:131, Dec. 1943.

(43) Milne, A.: Ann. Applied Biol. 32:128, 1945.

(44) Sibley, R. L.: U. S. Pat. 2,122,-389, 1938.

(45) E. I. Du Pont de Nemours & Co., Inc.: Brit. Pat. 557,874, 1943.

DITHIOCARBAMATES

(*Continued from Page* 18)

"Dithane" plus zinc sulfate and lime and the zinc dimethyl dithiocarbamate control early blight as well as or better than Bordeaux and are superior to the fixed coppers and "Fermate." Against anthracnose "Fermate" is as effective as "Zerlate" and both are as good as or better than "Dithane" and Bordeaux. There have been some reports of "Dithane" causing slight injury to tomatoes.

Against celery blights "Zerlate," "Methasan," "Dithane" plus zinc sulfa-lime and "Fermate" have given control equal to or better than the best copper sprays. In limited tests these dithiocarbamates also have been used successfully as foliage sprays on cucumbers and various other vegetables. There is an indication that "Fermate," in particular, is at least equal to the standard mercury treatments of sweet potatoes as a pre-bedding dip to increase sprouting and as a sprout dip to control various soil diseases and to increase yield; also "Fermate" has shown some stimulation of the sprouting of potato seed tubers and possible reduction of Rhizoctonia.

Tobacco blue mold or downy mildew is a serious seed bed disease and the standard control has been fumigation with para dichlorobenzene. This control has been much simplified by the use of "Fermate" spray which is proving very successful, while recent tests show the promise of "Fermate" in a dust application.

Limited results have shown the possibility of using the dithiocarbamate fungicides in dusts together with hormone preparations on cuttings of various kinds to suppress soil fungi when the cuttings are rooting. Interesting possibilities have also been shown for these fungicides when applied directly to the soil to control damping-off organisms and other fungi.

In this survey of the derivatives of dithiocarbamic acid their wide application and importance as agricultural fungicides have been shown. There are already in the literature several hundred reports on this group of fungicides. It is to be expected that as time goes on and our information becomes greater, particularly on the newer products, further uses will be discovered. At the same time, however, some present possibilities will be found less favorable and especially will these derivatives have to meet the competition of even newer organic fungicides with more effective and specific applications. The discovery of an outstanding new group of fungicides such as the dithiocarbamic acid derivatives, in addition to being of agricultural and industrial importance, also stimulates the research for newer and better chemicals to control our ever increasing plant diseases.

Selected References

Tisdale, W. H., and I. Williams. Disinfectant. U. S. Patent 1,972,961. Apr. 30, 1934.

Marsh, R. W. Some applications of laboratory biological tests to the evaluation of fungicides. Ann. Appl. Biol. *25*:583-604. 1938.

Tisdale, W. H., and A. L. Flenner. Derivatives of dithiocarbamic acid as pesticides. Ind. & Eng. Chem. *34*: 501-502. 1942.

Dimond, A. E., G. W. Heuberger, and J. G. Horsfall. A water soluble protectant fungicide with tenacity. Phytopatha. *33*: 1095-1097. 1943.

Goldsworthy, M. C., E. L. Green, and M. A. Smith. Fungicidal and phytocidal proerties of some metal dialkyl dithiocarbamates. Jour. Agric. Res. *66*: 277-191. 1943.

Hamilton, J. M., and D. H. Palmiter. Fermate—a promising new fungicide. Farm Research (New York Agric. Exp. Sta. Geneva) *9*(2): 14. 1943.

Dietz, H. F. List of publications on Fermate fungicide from September 11, 1934, to July 1, 1944. Mimeographed. 9 pp. E. I. duPont de Nemours & Co., Inc. Grasselli Chemicals Dept., Wilmington 98, Delaware. 1944.

Heuberger, J. W., and T. F. Manns. The use of zinc sulphate-lime as a supplementary material to improve the protective value of organic and inorganic copper fungicides against early blight of potatoes. Delaware Agric. Exp. Sta. Pamphlet 10. 4 pp. 1944.

Ruehle, G. D. Outstanding potato late blight control in Florida with a new organic fungicide combined with zinc sulfate. Plant Dis. Reptr. *28*: 242-245. 1944.

Heuberger, J. W. Dithiocarbamic acid derivatives as fungicides and insecticides. *In* Symposium on new developments in fungicides. Plant Dis. Reptr. Supp. *157*: 156-161. 1945.

Wilson, J. D. Organic fungicides and the control of vegetable diseases in Ohio. Ohio Agric. Exp. Sta. Bimonth. Bull. *30*: 49-61. 1945.

American Phytopath. Soc. Vegetable Seed Treatment Sub Committee of the Seed Treatment Committee. Seudies on vegetable seed treatments in 1943. Ditto 1944. Plant Disease Reptr. Supp. 145. 97 pp. 1944; Supp. 161. 66 pp. 1946.

Results of cooperative corn, flax and soybean seed treatment tests in 1944. Plant Disease Reptr. Supp. *159*: 201-224. 1945.

American Phytopath. Soc. Fungicide Committee, Potomac Division. Progress in testing the relative effectiveness of new organic fungicides in the control of plant diseases. A summation of nation-wide data in 1945. Mimeographed. 21 pp.★★

KAOLIN CLAYS

VELVEX

and

TYPE-41

For use in extending DDT and other insecticidal materials

APPROVED by entomologists, these clays have also met with general acceptance by mixers and blenders of agricultural insecticides.

- NON-ABRASIVE
- SMALL PARTICLE SIZE
- CHEMICALLY ADAPTABLE
- GOOD ADHESIVE CHARACTERISTICS

For Information and samples write

SOUTHEASTERN CLAY COMPANY

AIKEN, SOUTH CAROLINA

Good News

for

AGRICULTURAL ZINC USERS

Attention Distributors

•

We now offer in carload quantities our ZINC COMPOUND 38% Zn for use in Agricultural Zinc Sprays and in nutritional Zinc applications. This product is composed of various Zinc components blended to give a uniform non-hardening product which is easier to handle than some Zinc materials. It has been tested and is used in Florida to correct Zinc deficiency. Many carloads have been used for this purpose with complete satisfaction.

Used with complete satisfaction in Georgia and South Carolina in formulas containing Arsenate of Lead. If you sell Zinc for Agricultural applications write for details and samples.

Prompt carload shipments

•

W. R. E. ANDREWS SALES CO.

1505 Race Street, Philadelphia 2, Pa.

Since 1926

Agricultural Chemicals Specialists

FERTILIZER INDUSTRY

(*Continued from Page* 35)

Phosphate Market Sound

The basic soundness of the relatively simple process of treating ground phosphate rock with sulfuric acid will still retain the larger part of the total phosphate market in fertilizers for that process. In spite of the fact that the southeast appears to be over-capacitied for the production of this type of material, some new, modern production units are being installed there, following cost studies which indicate that even in old well developed areas there remains room for stepped-up efficiency and venture capital which does not recognize so-called maturity in such a section as a synonym for industrial senility.

The ordinary superphosphate alone being produced this year will call for about 7,500,000 short tons of sulfuric acid, 50 degree Beaume' basis. This acid in turn called for something more than 1,400,000 short tons of sulfur equivalent. In addition to these, substantial amounts of phosphoric acid as such and elemental phosphorus are used in the production of double superphosphate.

Concentrated superphosphate production will apparently out-strip any previous record as far as this industry's production is concerned. Some phosphoric acid as well as anhydrous ammonia will be used for fertilizer purposes in irrigation water in the west. Which reminds me that as I recently read an advertisement of anhydrous ammonia for such use, I automatically felt thankful that someone had exposed me to enough chemistry so that I did not wonder why the N had to have H_3 after it, resulting in its dilution from one hundred per cent plant food element to something a little better than eighty per cent Nitrogen.

With potash materials used by the fertilizer industry currently exceeding one and a quarter million tons for the year, you now have some general conception of the magnitude of the three groups of raw materials that go to make up the so-called major nutrient supplies. Nor should we ignore the lesser quantities of materials which bring into our industry the secondary and minor nutrients. Neither should we forget the liming materials which furnish calcium and magnesium as well as act as soil sweeteners. Most of the liming materials are applied direct to our agricultural land and, except as we in the fertilizer industry use magnesium limestone in particular in our products, it would be presumptuous to claim the millions of tons of that class of material which plays such an important part in sound agricultural practices.

This vital chemical industry furnishing food for plants currently accounts for $500,000,000 in annual volume. There are numerous possibilities in the volume and the challenges it may hold forth as we look ahead. But, no one with any business sporting blood wants more than a reasonable opportunity to test his knowledge and judgment as he exercises his spirit of enterprise and helps build a still better industry to serve so fundamental a need as fool production.★★

Table Three

Production of Superphosphates in the United States—Tons of P_2O_5

Types	1929	1934	1939	1944	1946-47
Ordinary	710,700	477,500	632,600	1,213,100	?
Double .	34,900	31,300	125,500	126,500	?
Total	745,600	508,800	758,100	1,339,600	1,500,000
Volume Index	100	68	117	180	201

Table Four

Potash Consumpton in the Continental United States, Calendar Years. Short Tons of K_2O

	Per cent of Total		
Class of Material	1925	1940	1945
60% Muriate of Potash	7.4%	69.2%	78.5%
50% Muriate of Potash	34.9%	20.5%	8.8%
Sulphate of Potash	14.5%	7.0%	5.2%
Sulphate of Potash-Magnesia	—	0.3%	2.5%
Manure Salts and Kainite	43.2%	3.0%	5.0%
Total K_2O Volume Trend	100	152	269

(Data for this table furnished by the American Potash Institute)

EXPERIMENT STATIONS

(*Continued from Page* 40)

tain insects, particularly because these mixtures do relatively little injury to plants.

Some time was devoted by the Ames specialists to statistical matters, particularly methods for calculating the median lethal dose (L D-50) of insecticides. Brief reports are made on treatment of hemp and flax seed, winter wheat and soybeans for control of seedling diseases. Investigation was continued of fumigants for control of certain insects in corn stored on farms and in commercial bins and a paper on the subject was prepared for publication.

New Hampshire Experiment Station at Durham continued during 1945 a project of several years' duration to develop techniques for examining new chemical compounds as insecticides. Two groups of compounds were discovered and in each group about 30 related chemicals were studied. Several in each group "stand out encouragingly," says the report, which also states that in studies of the new compounds as contact insecticides several were discovered which are repellant to insects. New Hampshire's continuation of studies of aerosols led to discovery of two or three new compounds, one of which could be incorporated into liquid "Freon" without added solvent to give high mortality at relatively low concentration.

At the Cornell experiment station, Ithaca, N. Y. studies of agricul-

tural chemicals during 1945 ranged from use of "Cyanogas" to kill starlings, to seed treating compounds, soil fumigants, weed killers, blossom thinners, fertilizer components and dairy disinfectants, as well as insecticides. Tests of DDT on lettuce and onions indicated that "the lettuce had probably absorbed no DDT," and that there was "a lack of actual absorption of DDT by the onions."

A major disappointment was registered by the complete failure of DDT against the alfalfa snout beetle, both in baits and sprays. Very low kills were obtained and baits containing DDT were far inferior to those using sodium fluosilicate, the report states. DDT, however, was found greatly superior to lead arsenate as a soil treatment against the European chafer. Where DDT was plowed under to a depth of 6 to 8 inches, larval mortality was almost complete at 10-, 20-, and 30-lb. dosages. This pest was first discovered in New York state in 1942 and the report asserts that on the basis of data now on file it appears likely that the European chafer will surpass the Hessian fly as a pest of wheat.

In a study of the control of external parasites of livestock two new formulae for controlling sheep ticks; a method of power-dusting feeder lambs for tick control and the use of DDT for house fly control in stables and other buildings were listed as major achievements.

Phenothioxin was found equal to rotenone in dip formulae against the sheep tick. A recommended dosage was 8 lbs. to a hundred gallons, but since it costs more than the standard rotenone, it was recommended only when the latter is unobtainable. DDT spray in dairy barns and poultry enclosures was found effective for 90 days against flies, the maximum dependable dosage being 20 percent DDT material in 100 gallons. Two treatments per year were considered adequate under average conditions, bringing cost for control of flies far below that of sprays previously used.

Sodium selanate, applied to the soil for control of a number of greenhouse pests was demonstrated as practical in numerous large scale Cornell tests. This material, it is explained, is taken up by the plant and poisons the pests as they feed, thus giving continuous, automatic control for long periods from a single application. Excellent control was given of five insects infesting chrysanthemums and others on carnations, cyclamens, hydrangeas, azeleas, geraniums, lilies, sweet peas, snap dragons, callas and a variety of succulents. Safe and effective dosages have been determined and practical methods of application worked out, the report announced.

Discovery and development is also reported by the Cornell station of a new fumigant, azobenzene, for control of red spiders on roses, carnations and possibly other greenhouse crops. After preparation the fumigant is applied to cold pipes before turning on the steam. Vaporization follows without expenditure of time by an operator, thus reducing the cost of the only previous effective method of treatment by syringing with water.

DDT

Manufactured by

MONTROSE CHEMICAL CO.

120 Lister Ave. Newark 5, N. J.

Sales Agents

R. W. Greeff & Co. Inc.

10 Rockefeller Plaza New York

Suppliers' Bulletins

Niagara Catalog

Niagara Sprayer and Chemical Division of Food Machinery Corporation, Middleport, N.Y., has issued its first catalog describing the full line of Niagara products including arsenicals, copper products, hormone dusts and sprays, rotenone and rotenone dust, dormant sprays and emulsions and the machinery for application of such. Various cattle grub killers are described also, and under industrial sulfurs are listed refined sulfurs, powdered sulfur, refined roll brimstone, etc.

Occupying an impressive portion of the 86 page booklet is the dusting machinery division picturing equipment including fruit dusters and crop dusters in a variety of capacities and for various purposes. The cover of the catalog is a colored map of the United States with the states laid out with symbols of the agricultural products of each.

•

'Yellow Cuprocide' Offered

Rohm & Haas Company, Philadelphia, announce the availability of "Yellow Cuprocide," fungicide, which during the war years was virtually unobtainable for civilian use. The company reports current sales of 50 per cent more than in pre-war days.

The material features efficiency in lower concentrations, due to small particle size, and the fact that they contain 80 per cent copper. Even distribution is possible with the product, and the fungicide is not dependent on morning or evening dew to make it stick to plants, according to its manufacturers.

"Yellow Cuprocide" has been used on a number of crops, but has proved particularly successful for the prevention of early and late blight on potatoes. According to A. A. Granovsky of the Bureau of Entomology and Plant Quarantine, U.S.D.A., the product when combined with DDT gave better potato insect control than the same quantity of DDT alone.

It is pointed out that "Yellow Cuprocide" dusts and sprays are not confined to use on potatoes, but have been used in prevention of blight on tomato plants and seed beds, on celery, cucurbits, cantaloupes and walnuts as well as for other diseases of citrus and truck crops.

•

Intern'l Chem. Reports

International Minerals and Chemicals Corp., Chicago, in its annual report, for the fiscal year ending June 30 last, released in September, reported sales of $34,373,106 and income of $2,925,657, representing a sales increase of 13 percent and income increase of 7 percent over the preceding year. Additions to fixed assets during the year included 1,800 acres of high grade phosphate ore reserves near Barstow, Fla.; the largest dragline ever built for phosphate mining, to be used at the Peace Valley, Fla. mine; completion of plant food factories at Mason City, Ia., and Hartsville, S. C.; and enlargement of facilities at other locations.

•

Weed Killer Folder

A listing of weeds susceptible to its 2,4-D weed killer product, "Knox-Out Weeds" is published by Pennsylvania Salt Manufacturing Co., Philadelphia. The pamphlet contains tables for mixing the solution for spraying, directions for its use, and suggestions as to when to apply the chemical to advantage. Precautions in use are given, along with instructions on how to handle poison ivy and how to care for spraying equipment in which weed killers are used.

•

Hexaethyl Available

Semi-plant production of hexaethyl tetraphosphate is announced by Eston Chemicals, Inc., Los Angeles, Calif. According to the company, the insecticide in limited quantities is available for use by manufacturers for compounding or repackaging. Hexaethyl Tetraphosphate in dilutions ranging from 1 to 1,000 to 1 to 4,000 has been found to have promise as a control for aphids and spider-mites. Eston indicates that further information will be furnished upon request. The company is located at 3100 East 26th St., Los Angeles 23.

•

du Pont DDT Article

An article, "DDT Yesterday and Today" appears in the August-September *du Pont Magazine*. It goes into the history of man's long fight to control insect pests in every nation, and how DDT has brought nearer to realization that end. The author, George Albee, recalls how unrestricted and frequently over-enthusiastic publicity about the product brought pressure to bear on insecticide manufacturers for the material to be distributed to the public. He relates how reputable manufacturers of DDT felt that a thorough investigation of the preparation should be made before turning it over to an impatient public. How this was accomplished by intensified research and through correlation of information by military and Government agencies is told.

The use of DDT in agriculture is described, both from the standpoint of what has gone before and is being done at the present time. Fruit-growers, livestock owners, diarymen and others are among those mentioned as benefitting from use of DDT.

•

New Sulfur Source

Announcement is made of the "fourth large discovery of sulfur on the North American continent in the past fifty years" in the completion of four wells in the Province of Vera Cruz, Mexico. The drillings, undertaken by the Mexican Gulf Sulphur Company and the American Sulphur Company, S. A. (a Mexican Corporation), have uncovered what is apparently a very large new deposit of salt dome sulfur. According to Eugene L. Norton, president of Mexican Gulf Sulphur Co., the new deposits are similar in nature to the large deposits now being mined on the Gulf Coast of Texas and Louisiana. These states form the major source of sulfur.

GUEST EDITORIAL

(*Continued from Page* 14)

the instructions and recommendations submitted by each manufacturer. Much might be done to simplify labels and standardize recommended formulas without sacrificing initiative and enterprise in salesmanship.

Such an effort would be appreciated by both consumers and the trade and would be welcomed by enforcement officials, thus adding to the backlog of public good will now enjoyed by the agricultural chemical industry.★★

•

COMMENTS

(*Continued from Page* 41)

way in compelling truthfulness in labeling and maintaining uniformity in composition of their products, with resulting confidence of users.

Formerly California law did not have jurisdiction over agricultural chemicals to be sent outside the state. The Federal Food, Drug and Cosmetic Act of June 1939 contains a proviso that "A food, drug, device or cosmetic intended for export shall not be deemed to be adulterated or misbranded under the Act if it . . . (2) is not in conflict with the laws of the country to which it is intended for export, and (3) is labeled on the outside of the shipping package to show it is intended for export . . ." This reminds one of the "floater" policy where a worthless character is given an option to leave town instead of being sent to jail. It does not seem ethical to omit punishment and pass either people or products along to another community that does not know of their shortcomings. Conditions of control should be such that when one sees "Manufactured in U.S.A." on a label he may know the product is good and dependable.

In 1910 there were very few products placed under regulation, but now there are thousands of economic poisons to be supervised. Then it was important to consider only about ten compounds, and to pick out the unsatisfactory ones. Now new and complicated products are being developed constantly, and vigilant surveillance is all the more necessary. At the outset, with the simple compounds then in use, health hazards were easily recognized and corrected.

Now new materials may be developed and produced in tonnage amounts for general usage before their toxicities and hazards to human beings are fully known. Some products have had to be abandoned, not because they were ineffective or adulterated, but because they presented an intolerable danger to human beings, or were injurious to the host.

Successful products must serve the purpose intended, not injure the host plant or animal, and be acceptably controlled from the health angle. A good law properly administered protects the public and manufacturers from unanticipated difficulties. Support of new legislation to meet the new problems is imperative.★★

SING A SONG OF SELLING
OH! WHAT A TUNE!
Your good chemical product sells well enough by itself. And so do Lowell Sprayers and Dusters. But why not team them up in a fast-selling duo?
Your product is most effective when it is applied properly. To get the best application a good sprayer or duster is a must. When your product is applied right, it produces the best results and you get repeat sales. So we say "let's team up!"
Don't be "insecticide-wise and sprayer-foolish." Let Lowell Sprayers and Dusters help build business for you. Write us!
LOWELL
Manufacturing Co.
Dept. 59 • 589 East Illinois Street • Chicago 11, Illinois
YOUR PRODUCT
LOWELL
inman
WORLD'S LARGEST MANUFACTURER OF SPRAYERS AND DUSTERS EXCLUSIVELY

Raw Material Markets . .

ALTHOUGH the off-season for both insecticide and fertilizer products is here, there is a general scurry among manufacturers to replenish badly depleted supplies. The carry-over, particularly in certain insecticides, is the smallest for many years.

Insecticide Report

Stocks in general are exceedingly low on many items in the insecticide field, but so far as the past season is concerned, the most essential requirements for insecticides and fungicides have been met despite many hindering factors. Production of arsenic during the year has been low, but imports maintained at the 1945 monthly average have helped the situation.

Calcium Arsenate Very Low

From the fact that stocks of calcium arsenate are exceedingly low and the carry-over practically nil, the demand for this insecticide during 1947 must of necessity be met by the season's output, whatever it may be. The output of calcium arsenate in July 1946 (6,438,000 lbs.) was 56 percent above production during June. Exports were high in July, totaling 167,000 lbs., 70 percent above the total for June.

The July output of lead arsenate hit a three-year low, 1,848,000 pounds. Causes for this condition were the usual seasonal cutting of production and the drastic shortage of lead. Exports of lead arsenate reached 159,000 pounds in July, compared with 87,000 in June.

Enough Copper Sulfate

Heavy export demands are still noted in the copper sulfate field, even though domestic agricultural requirements have fallen off. July exports totaled 9,562,000 pounds of copper sulfate, 77% above shipments during the same month of 1945. American output formerly destined for Canadian consumption may be available for U. S. farmers since a newly-inaugurated program of copper sulfate production has been launched by a firm in Canada. Its reported output is some 400 tons monthly; enough to meet domestic needs.

Rotenone Improved

Although the peak demand for rotenone is past for this season, some areas continue to use the insecticide late in the season. Supplies are more plentiful now, following a tight situation which characterized the stock supply earlier. Imports received during July totaled more than the entire amount of cube and timbo received the first half of the year. Total for the first seven months was 5,340,000 pounds. Imports to the U. S. from Iquitos, Peru are thought to be assured despite a new Peruvian law which makes rotenone subject to an export tax. (Peruvian producers and exporters anticipated the tax, and this assumption was a basis for last April's increase in prices granted under the 1-year extension.)

Pyrethrum Plentiful

Unlike some other insecticides, supplies of pyrethrum are enjoying a sizeable carryover in addition to impressive imports from Kenya, Belgium Congo and Peru. Total July imports reached 1,990,000 lbs. Pyrethrum exports were low in July, amounting to only 5,000 lbs., compared to 19,000 lbs. which went out in June.

DDT Situation Tight

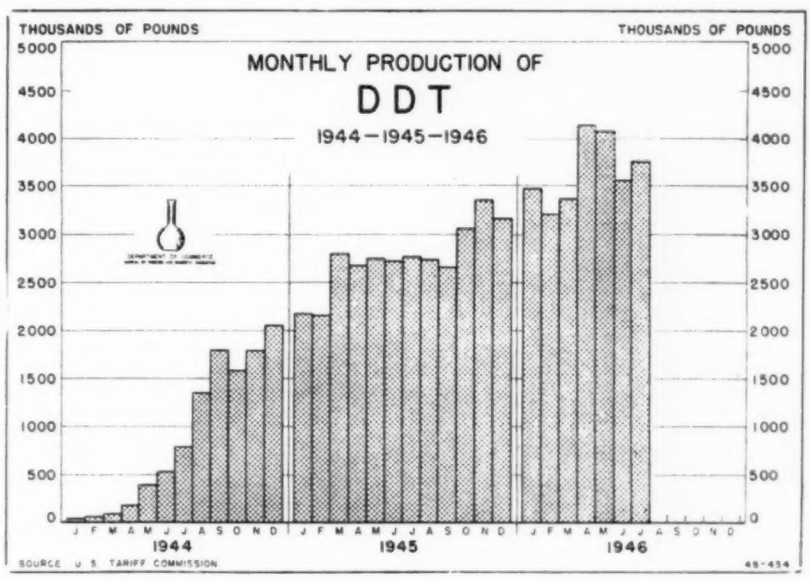
Although production of DDT was better in July than in June, demand still outstrips producers' capacity. July's output this year (3,753,000 lbs.) was about a million pounds greater than that of July, 1945, and 211,000 lbs. over the output for June, 1946.

Fertilizer Report

Buying interest of farmers is higher than normal this fall, although the seasonal lull has slowed the flow of sales which characterized previous months. Transportation of fertilizer supplies continues to be a serious bottleneck, new railway cars being unavailable to replace worn-out ones. Tax tag sales of fertilizer were considerably above normal during the summer months, the 1946 figure for June, July and August being 251,805 tons over the corresponding period of last year, and 755,148 tons over that period of 1939.

Nitrate Production Up

Production of Chilean nitrate during the final quarter of the 1945-46 fertilizer year was about 35 per cent greater than during the same period of the previous year. Approximately one third of the output during 1946-47 is expected to go to the United States.



(Imports of Chilean nitrate in July, amounting to 31,673 tons, were off 66 percent from the peak in June, 1946.)

Output of byproduct ammonium sulfate in July was 64,842 tons, slightly less than that of July, 1945, but 19 percent over June, 1946. With the passing of peak demand, producers' stocks increased greatly by the end of July.

Superphosphate Stock Low

Some accumulation of stocks was seen in July when sales and consumption of superphosphate remained below total output. However, the amount on hand (593,568 tons) at the end of the month was 22 percent less than inventories at the same time in 1945. Shipments were well above last year's level during the first four months of 1946, but lagged since April. This year's consumption has surpassed that of last year during the first seven months, however.

Concentrated superphosphate production in July (23,015 tons) was 9 percent greater than during the same month last year, but since shipments exceeded production for the first time since March, a small drop in stocks was noted. The P_2O_5 equivalent of all grades of superphosphate produced totaled 118,303 tons in July as compared to 120,033 tons in that month of 1945. Comparable figures for total disposition during the two months were 107,707 tons and 112,086 tons, respectively.★★

Micro Nu-Cop

A fixed neutral insoluble micronized* tribasic copper sulphate containing 53% metallic copper for dusting or spraying. No lime required—extremely fine particle size, 2-5 microns.

*Trade Mark registered U. S. Patent Office by Micronizer Processing Company, Moorestown, N. J.

AVAILABLE
From One Source:

A complete list of agricultural products for the dealer backed by nearly a quarter century of experience in serving the industry:

Agricultural Insecticides
Fungicides
Seed Protectants
Fertilizers
Weed Killers
Feedstuffs
And allied materials

☆

Modern well-situated warehouse facilities, a technically trained staff and experienced local representatives enable Faesy & Besthoff to provide efficient, economical large-scale distribution for leading manufacturers.

All products offered by this organization have proved their value under actual field conditions.

☆

FAESY & BESTHOFF, Inc.
Chemicals for Agriculture
220 E. 42nd Street New York 17, N. Y.

INSECTICIDE DEALER

(*Continued from Page* 32)

desirable species. The countryside may find itself completely rid of all insect life if this same dusting and spraying is carried on year after year.

While DDT was a boon to potato growers this year, it also was at least partially responsible for the "up to our necks in potatoes" condition which developed from the bumper crop. The Government made unsuccessful attempts to establish a guaranteed "floor" price of $1.87½ and to make it hold. Rather than go through the red tape necessary to get the $1.87½ Government figure, many growers in order to move their crop, made sales at $1.70 and less. At this latter figure, they made money and generally are in a good financial position in getting ready for 1947. Inasmuch as they buy and sell potatoes, as well as supply seed potatoes, Mr. Benjamin's company is not only close to the picture, but has a direct interest in the financial welfare of the local grower.

Although Long Island produce has been in business for almost 25 years, fertilizers, equipment, and produce were its main business up to 1930. At that time, they entered the insecticide and fungicide field, mixing, blending and distributing for their fertilizer customers. With the advent of insecticides, their equipment interests also broadened to include application devices. At the moment, in conjunction with the state people, they are working to develop a new type row crop spray-duster especially suitable for treating potatoes under Long Island conditions. This is another example of making the growers' problems their problems, reflecting a closeness to the field which has paid off in a steadily growing business and full consumer confidence over the years.★★

Industry Patents

2,408,307. Insecticide. Patent granted September 24, 1946, to Samuel I. Gertler and Herbert L. J. Haller, Washington, D. C., assignors to the United States of America as represented by the Secretary of Agriculture and his successors in office. An insecticidal dust composition comprising acetophenone semi-carbazone in the form of an impalpable powder admixed with a solid diluent.

•

2,408,774. Spray Tank for Dispersing Fluids from Aircraft. Patent granted October 8, 1946 to Rupert Goddard, Havre de Grace, and Fleming R. Weaver, Edgewood Arsenal, Md. Tank is a liquid spray device for airplanes, comprising a jettisonable storage tank for the liquid to be dispersed, and adapted to be mounted on the airplane, an internally positioned vent tube opening at one end thereof to the atmosphere through the wall of the tank whereby positive pressure is produced for discharging the contents of the tank, and at an opposite end opening into the tank, a discharge line extending from the tank, destructible closure elements for the vent tube and discharge line respectively, and detonating instrumentalities disposed in proximity to each of the respective closures for removing them, each of said instrumentalities having electrical control wires extending therefrom for operation by remote control.

•

2,409,429—Production of Hydrocyanic Acid. Patent granted October 15, 1946, to Howard Donovan Green, Pasadena, Calif., and Philip Roe Hendrixson, Moundsville, W. Va., assignors to E. I. duPont de Nemours & Company, Inc., Wilmington.

In the production of hydrocyanic acid by reacting, in a refractory container, a mixture containing nitric oxide and a gaseous hydrocarbon together with at least one of the gases taken from the group consisting of water vapor, oxygen and nitrogen in the presence of a catalyst containing a metal of the platinum group, said reaction being free from carbon formulation, the steps comprising periodically interrupting the reaction, abrading the walls of the refractory which are contacted by said gaseous reaction mixture, and resuming the reaction.

•

Trade Mark Applications

Application has recently been made to the U. S. Patent Office for registration of the following trade-marks for products in the agricultural chemical field, and the marks listed were published in Sept. and Oct. issues of the OFFICIAL GAZETTE. The Patent Office requires that notice of any opposition to registration of a trade-mark be filed within thirty days of publication in the GAZETTE, accompanied by a fee of ten dollars.

Bazooka—In heavy caps and lower case letters, for insecticides. Filed May 16, 1946, by Nash & Kinsella Laboratories, Inc., St. Louis. Claims use since September 9, 1944.

Fleetick—In tall sans serif capital letters, for ant exterminator preparations. Filed June 6, 1945 by Sander Brichta, doing business as Sander B Company, Phoenix, Ariz. Claims use since May 9, 1945.

Farm Master—In capital letters in box, with drawing of farmer between words. For Peat Moss, used as a poultry litter. Filed Feb. 7, 1946, by Sears, Roebuck & Co., Chicago. Claims use since Jan. 15, 1941.

Tecmangam — In heavy sans serif capital letters, for chemical preparation including the sulfates of manganese, ammonium, and magnesium for general use in the agricultural and industrial arts. Filed Nov. 8, 1945 by Tennessee Eastman Corp., Kingsport, Tenn. Claims use since Nov. 7, 1930.

RHothane — In typewriter style letters, first two of which are capitalized. For insecticides, fungicides and disinfectants. Filed Aug. 31, 1945 by Rohm & Haas Co., Philadelphia. Claims use since Aug. 23, 1945.

Dandy-Kill — In caps and lower case, for weed killer. Filed Mar. 1, 1946 by Plant Products Corporation, Blue Point, N. Y. Claims use since Sept. 24, 1945.

Zeto—in heavy capital letters, for insecticides. Filed March 20, 1946, by Jerome D. Kennedy, doing business as United Chemical Co., Rutland, Vt. Claims use since Sept. 11, 1945.

Hearthstone—In old English letters, for fertilizers. Filed Sept. 13, 1945 by Plymouth Wholesale Dry Goods Corp., New York. Claims use since Feb. 13, 1945.

Quinosin—In sans serif capital letters, for chemical products for use in combatting fungi in the agricultural field. Filed Mar. 14, 1946 by Monsanto Chemical Co., St. Louis. Claims use since Feb. 11, 1946.

•

Trade Marks Granted

423,688. Fungicide for addition to a varnish, paint, or lacquer. Filed Jan. 16, 1945, by Mer-Q-Ree, Inc., Bethesda, Md.

423,689. Insecticides. A. Bromm & Co., Evansville, Ind. Filed Jan. 22, 1945.

423,773. Liquid Chemical Preparation for wood preservative, fire retardant, termite repellent, damp rot and dry rot preventative, and mildew preventative. Raymond G. Lamoureux, Inglewood, Calif. Filed Nov. 13, 1945.

423,803. Liquid Insecticide. York Pharmacal Co., St. Louis, Mo. Filed Dec. 11, 1945.

423,817. Exterminator for rats and mice. Edward J. Lizotte, Liberty, N. Y. Filed Dec. 27, 1945.

423,839. Insecticide in composition form. Griffith Laboratories, Chicago, Ill. Filed Jan. 17, 1946.

423,845. Insect Spray. National Chemical and Metal Co.; also doing business as Carnegie Chemical Mfg. Co., Los Angeles. Filed Jan. 21, 1946.

423,846. (Same description as 423,845.)

423,866. Insecticide Repellent. R. M. Hollingshead Corp., Camden, N. J. Filed Feb. 23, 1946.

423,869. Veterinary Flea and Louse Powder. Lederle Laboratories, Inc., New York. Filed March 1, 1946.

Pest Control Association Holds 14th Annual Meeting in New Orleans, La.

J. Harvey Sturgeon, Louisville, Ky., was named president of the National Pest Control Association in its 14th annual convention held October 28, 29 and 30 at New Orleans, La. Mr. Sturgeon is proprietor of a Pest Control Company which bears his name in Louisville. Other officers elected included: H. O. Abel, Dallas and Houston, Texas; John G. Vogel, Philadelphia; V. H. Montgomery, San Francisco; Harold E. Jennings, Chicago; J. Edwin Sameth, Newark, N. J.; and Glen H. Burnett, Atlanta, Ga., regional vice-presidents. The new secretary is William O. Buettner, Brooklyn, N. Y., and treasurer is Robert C. Yeager, Cincinnati, Ohio.

Directors, named for terms of three years are I. B. Carncross, Syracuse, N. Y.; C. C. Delk, Fresno, Calif.; Charles Denny, St. Louis; Louis Gatto, Beaver Falls, Pa.; Jacques J. Hess, New York; Charles Partlow, Lafayette, Ind.; and Mark Weintraub, Boston. Two directors for terms of one year were named as follows: Joseph W. Hahne, Omaha, Nebr.; and P. Henry Maheu, Montreal, Que., Canada, Canadian representative.

The discussions held at the meeting covered many phases of the industry, with emphasis on the general theme of "Knowledge." Committee reports, and business sessions featured the opening day's activities, with symposiums on rodent control being held later in the day. Topics dealing with public health in relation to rat control were discussed, and recommendations made for baiting, formulations, and precautions to be observed in the process.

Tuesday's discussions took up wood destroying termites, the speakers citing problems peculiar to various parts of the country, and the remedies to be used in each case. Problems of the industry were analyzed in open forum with matters of legislation, safety, bookkeeping, and employee training receiving a large portion of the attention. Next year's meeting is set for Philadelphia.

Amer. Potash Elects

Bernard R. Armour, president of the Heyden Chemical Corporation, was recently named chairman of the Board of Directors of the American Potash and Chemical Corporation. Mr. Armour succeeds W. J. Froelich who resigned. Elected to membership on the Board are Dr. Donald B. Keyes, vice-president of Heyden Corp., and William S. Glazier of Lehman Brothers. Dr. Keyes and Robert Brown, the latter of Kuhn, Loeb & Co., were named to serve on the Board's executive committee.

•

Shell Studies Oil Uses

Full investigation into possibilities for utilization of petroleum products in agriculture is being made by Shell Oil Company at its new 142-acre test laboratory at Modesto, California, according to Paul E. Laken, director and marketing vice-president of the company. Among subjects under investigation, he states, are the use of oil in flame throwers to kill weeds, oil as an ingredient in insecticides, as a carrier for plant hormones, and as an element in fertilizers.

•

Rochester Employs 2,4-D

Municipal authorities of Rochester, N. Y., conducted a campaign against ragweed during the past summer by use of a 2,500-gallon tank truck and 2,4-D weed killer. Private property was treated on request from owners, as well as all city-owned lands where ragweed patches were discovered. Using a 6,000-gallon railroad tank car, weeds in the city-owned subway bed were also sprayed.

•

Penn Co-op Insecticides

Pennsylvania Farm Bureau Cooperative Association, Harrisburg, Pa., is advising members to place orders now to cover 1947 insecticide requirements. Orders for fly spray placed before Feb. 1, 1947, the Co-op has announced, will carry a "guaranteed price," so that if prices go up, purchasers will be protected from the advance on delivery next year. Available for the coming season will be four products: "Unico Kill-Fly," a 5 per cent DDT surface and screen paint with residual action; "Unisol," a water-type livestock spray with DDT; and "Unico Fly Spray," for stock. All are supplied through United Cooperatives, Alliance, Ohio.

•

H. P. Gould Dies

Harris P. Gould, 75, for forty years in the U. S. Department of Agriculture's fruit and vegetable research division, died in Washington, D. C., October 17. He had retired from active service in 1941, at which time he was chief of the division of fruit and vegetable crops and diseases, later to become the Bureau of Plant Industry, Soils and Agricultural Engineering. He joined the U.S.D.A. in 1901.

Mr. Gould had made important contributions to fruit production. In his early days with the bureau he laid the foundation for its extensive research on the adaptation of fruit to different regions.

•

Calif. Fertilizer Meeting

The 23rd Annual Conference of the California Fertilizer Association was held October 14, 15 and 16 at Beverly Hills, Calif. Speakers at the sessions included Dr. W. W. Robbins of the University of California, Davis; C. T. Prindeville of Swift & Co., Floyd Wehwend, M. & M. Association, Maurice H. Lockwood, National Fertilizer Association, Wilson Meyer, Wilson & Geo. Meyer & Co.; Cedric G. Gran, Fertilizer Division of O.P.A.; W. T. McGeorge of the University of Arizona; and Weller Noble, National Fertilizer Association.

•

Kolker Hexaethyl Tetra

Kolker Chemical Company, Newark, N. J., manufacturer of organic chemicals, plans to produce hexaethyl tetraphosphate in the near future, it is announced. Production is expected to begin by January 1.

Rodent Control — Position wanted by biologist, graduate of Texas A & M, in some phase of practical or research rodent control. Thirty years of age. Immediately available. Prefer Eastern location. For further details, communicate with Box No. 130, Care of *Agricultural Chemicals*.

Classified Advertising

Rates for classified advertisements are ten cents per word, $2.00 minimum, except those of individuals seeking employment, where the rate is five cents per word, $1.00 minimum. Address all replies to Classified Advertisements with Box Number, care of Agricultural Chemicals, 254 W. 31st St., New York 1. Closing date: 1st of month.

Wanted — Agricultural Chemicals. Nitrogen - Liquid Phosphoric. Acid - Potash - Insecticides. Write Karl Ahlswede, Estb. Fertilizer Mfr., P. O. Box 81—Arlington—California (Riverside County).

Selling — Young man recently out of Navy desires position which will lead to selling job with insecticide, detergent or chemical manufacturer. Willing to start at bottom. College graduate, 25 years old. For further details, address Box 128, care of *Agricultural Chemicals*.

Plant Pathologist & Horticulturist — University of Maryland graduate. 25 yrs. experience in Fungicide Investigations, both laboratory and field, with the U. S. Department of Agriculture. Desires position with Insecticide firm either in Research or Technical Sales Service. Address Box 129, care of *Agricultural Chemicals*.

CONSULTING ENTOMOLOGIST

Insecticides — Formulation
Plant Pathology — Research
Entomology — Legal Service

Eighteen Years consulting work.
Thirty years technical agriculture.

DR. E. R. de ONG

926 Stannage Ave., Albany 6, Calif.

ALVIN J. COX, Ph.D.

Chemical Engineer and Chemist

(Formerly Director of Science, Government of the Philippine Islands; Retired Chief, Bureau of Chemistry, State of California, Department of Agriculture.)

ADVISOR ON AGRICULTURAL CHEMICAL PROBLEMS AND INVESTIGATIONS

Consultant in reference to spray injury and damage, claims, including imports of fruits and nuts, formulas, labeling, advertising and compliance with law.

1118 EMERSON STREET
PALO ALTO, CALIFORNIA

DDT AND SANITATION

(*Continued from Page* 37)

powder is also an excellent control for horn flies and some other flies on cows. It will also hold house flies, blow flies, and other filth-bred flies to a very low number indeed when the areas about the stables and barns are kept free from manure and other filth in which the insects breed. This powder diluted with water and sprayed upon the animals will make life much easier for them and they will in turn be much more profitable to the farmer. It is estimated that under some circumstances, biting flies cost the farmer up to 15% of his possible milk production. Flies are at their worst in the summer when the pastures are best and the milk flow should be at its highest.

A 50% wettable powder is much easier to use and may be used under a wider range of conditions than other forms of DDT available. It will meet practically all of the requirements of the dairyman for an insecticide. It must be remembered that DDT alone does not completely control maggots in a manure pile or an old straw stack. Manure has no place piled in the barnyard or in a stable. Here it can only breed pests and increase the dairy farmers' task of keeping cows clean.

Sanitation on a dairy farm means more than mere cleanliness in milking equipment and pest-free cows. It means stables free from everything which isn't necessary for dairy husbandry. It means maintaining cows with clean udders and clean teats. There is small chance of keeping udders, flanks, and teats tidy if the stables and yards are not clean. DDT will do a good job in killing flies and other insect pests of the dairy barn and dairy cow, but it can't clean the stables. Clean stables, clean udders, flanks and teats are absolutely necessary for the production of the clean, wholesome milk.★★

Advertisers' Index

American Cyanamid Co....Sept.
Andrews, W. R. E. Sales Co. 56
Atlas Powder Co.....Sept.
Attapulgus Clay Co..... 11

Baird & McGuire Co..... 10
Baker, J. T. Chemical Co. .....2nd Cover
Besler Corp. .....Sept.
Brooklyne Chemical Works .....Sept.

Cox, Dr. Alvin J..... 65

De Ong, Dr. E. R..... 65
Dodge & Olcott, Inc..... 38
E. I. du Pont de Nemours & Co. 44

Eastern Magnesia Talc Co.. 46
Edco Corporation .....Sept.

Faesy & Besthoff, Inc..... 62
Floridin Company .....Sept.

Geigy Co., Inc..... 52
General Chemical Co.....Sept.
General Dyestuff Corp. .....Oct.
Greeff, R. W. & Co..... 58

Hercules Powder Co.....Sept.
Hudson, H. D. Mfg. Co..... 36

Kolker Chemical Works.... 50

Literite Co., Inc.....Sept.
Lowell Mfg. Co..... 60
Lucas, John & Co.....Sept.

McLaughlin Gormley King Co. 4
Merck & Co., Inc.....Oct.
Monsanto Chemical Co..... 3
Montrose Chemical Co..... 58

Niagara Sprayer & Chemical Co. .....Sept.

Orbis Products Corp..... 6

Penick, S. B. & Co..... 7
Pennsylvania Salt Mfg. Co.. 9
Phelps-Dodge Refining Co. .....Sept.
Powell, John & Co.....12 & 42
Prentiss, R. J. & Co...3rd Cover

Rohm & Haas Co..... 34

Southeastern Clay Co..... 56
Stauffer Chemical Co.....Sept.

Tobacco By-Products & Chemical Corp. 54

United Clay Mines Corp...Sept.
U. S. Rubber Co.. (Naugatuck Chemical Div.) ....Sept.

Vanderbilt, R. T. & Co..... 50
Velsicol Corp. .....4th Cover

(The Advertisers' Index has been carefully checked but no responsibility can be assumed for any omission.)

"Thanksgivin' time always arouses my cannibal instincts, Cuthbert."

Let's Talk Turkey....

WHEN you talk about your products with the idea of making sales, you can't afford to spend time and money letting your voice be heard among groups of people who have no interest in your products. It is much wiser to talk turkey, and talk it directly to the people you want to sell. That's why trade paper advertising has always been so effective—it allows you to tell your story directly to the very ones who should hear it.

If you want to talk turkey to your potential customers in the field of insecticides, fungicides, weed killers, fertilizers, and users of equipment for application of these, we suggest regular advertising in

AGRICULTURAL CHEMICALS

254 WEST 31st STREET NEW YORK 1

TALE ENDS

NOVEMBER, being the official month of thanksgiving, calls to mind some of the odd things for which people at times give thanks. In the town of Enterprise, Alabama, is a strange monument, unlike any other in the world. It is a tribute to the *boll weevil!*

The reason why any community, particularly one in the cotton belt, should erect such a paradoxical testimonial, is an interesting story. It dates back to the years before 1915 when in this southeastern Alabama county cotton was king, and the yield in the county averaged around 35,000 bales a year. But along came the boll weevil in 1915, and the crop was cut to about 60% of normal.

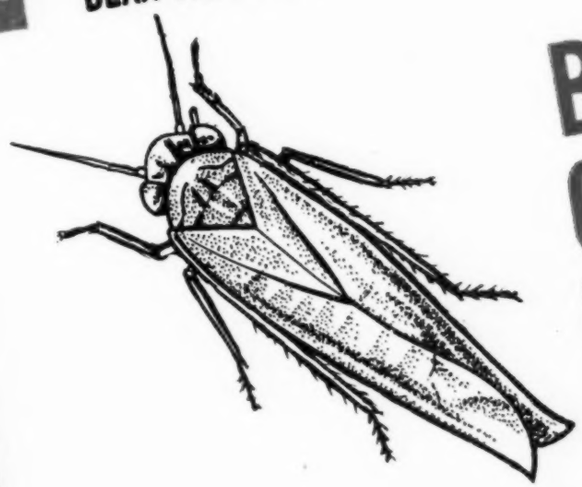
Unperturbed, the farmers in 1916 planted for a bumper crop and used calcium arsenate and other poisons profusely to stop the weevil. But that year only one third of the crop was harvested. The situation then became so serious that the Coffee county agriculturalists turned their attention to crops other than cotton, and for the first time corn, potatoes, peanuts, sugar cane and hay as well as livestock began to assume importance in the area.

Of all these, however, peanuts took the lead in supplanting cotton in the new agricultural scheme, and the county became the peanut capital of the nation.

Thus, out of gratitude for the rather rude awakening by the boll weevil, this monument was dedicated by the citizens of the countryside. The inscription appearing at the base of the memorial tells the story. It says:

IN PROFOUND APPRECIATION
OF THE BOLL WEEVIL
AND WHAT IT HAS DONE
AS THE HERALD OF PROSPERITY
THIS MONUMENT WAS ERECTED
BY THE CITIZENS OF
ENTERPRISE,
COFFEE COUNTY, ALABAMA

BEAN LEAFHOPPER



BUG OF THE MONTH

PRENTISS FOR PEST-TESTED *Basic Insecticides*

During the 1946 growing season the Bean Leafhopper was added to the constantly increasing list of pests effectively and economically controlled with DDT. Plan now to get your share of this large and lucrative market by using some of the following Prentiss DDT concentrates in your 1947 agricultural and livestock dusts and sprays.

MICRO MESH DRY (50% DDT Powder) a concentrated powder containing 50% DDT. Used for mixing to compound DDT powders that can be used as agricultural dusts, mosquito larvacides, louse powder, etc.

MICRO MESH WETTABLE (50% DDT Powder) a concentrated powder containing 50% DDT which can be used either in a spray or dust. Contains a balanced quantity of both wetting agent and dispersing agent and suspends in water with a minimum of agitation.

30% TECHNICAL DDT CONCENTRATE, containing 30% Technical DDT by weight in a special solvent, for use in manufacturing fly sprays or residual sprays.

25% WATER MISCIBLE DDT CONCENTRATE, ideal for use where emulsions as sprays are indicated.

PRENTISS 10% CONCENTRATE, a liquid concentrate containing 50% by weight of mixed DDT isomers, for use in manufacturing residual insecticides containing DDT isomers.

Present your problems to Prentiss! Our Insecticide division is so organized that prompt and expert technical advice may be obtained on all types of household, agricultural and livestock insecticide formulations.

R. J. PRENTISS & COMPANY, INC.

110 William Street, New York 7, N. Y. — 9 So. Clinton St., Chicago 6, Ill.

Plants: Brooklyn, New York and Newark, New Jersey

PRENTISS

RAW MATERIALS FOR AGRICULTURAL INSECTICIDES

Use the VELSICOL

METHYLNAPHTHALENES

FOR SOLVENT POWER · SYNERGISM · TOXIC ACTION · PLANT SAFETY

measure **P***erformance*

BY THESE PROPERTIES

Your customers do

The following table gives examples of stepped-up performance from formulations combining Velsicol Methylnaphthalenes with such toxicants as DDT, Rotenone, Benzene Hexachloride or Pyrethrum.

SOLVENT POWER

VELSICOL	TEMP.	Weight of DDT soluble in 1 gallon of Velsicol	Weight of DDT in 1 gallon of finished solution and % by weight of DDT
AR50	77° F.	5½ lbs.	3.6 lbs.—40%
	14° F.	3½ lbs.	2.6 lbs.—30%
AR60	77° F.	5½ lbs.	3.6 lbs.—40%
	14° F.	3½ lbs.	2.6 lbs.—30%
AR70	77° F.	5¾ lbs.	3.6 lbs.—40%
	14° F.	3¾ lbs.	2.6 lbs.—30%

SYNERGISTIC ACTION

Effect of Velsicol AR-60—DDT on greenhouse red spider

Concentration of Insect Toxicant	Percent Mortality
0.125% Velsicol AR-60 (Water Emulsion)	18%
0.312% DDT in Acetone (Water Emulsion)	22%
0.125% Velsicol AR-60 plus 0.312% DDT (Water Emulsion)	84%

INSECTICIDAL ACTION

Type of Formulation	Insect Species	Percent Mortality
3% AR-60 in Dust	Mature female potato aphid	99%
3% AR-60 in Dust	Third instar larvae Mexican Bean Beetle	98-100%
3% AR-50 in Dust	Heliothrips Haemarrhoidalis	98-100%

PLANT SAFETY

Type of Formulation	Effect on Representative Plants
3% AR-60 plus 2% DDT as dust with pyrophyllite	None
50% AR-60 plus 25% DDT with suitable emulsifier in water emulsion	None

Each one of the above factors is of vital importance in the efficient action of your formulations. You get all four with the VELSICOL Methylnaphthalenes, AR-50, AR-60, AR-70. Write for samples and complete information.

VELSICOL Corporation

Manufacturers of: Insect Toxicants · Aromatic Solvents · Synthetic Resins · Coresin Core Oils

General Offices: 120 East Pearson Street · Chicago 11, Illinois

Branch Offices: New York · Detroit · Cleveland

Representatives: E. B. Taylor Co., Los Angeles 13 · E. M. Walls, San Francisco 11 · J. E. Russell, Houston 1

In Canada: Natural Products Corp., Montreal 2